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The Reverse Logistics of Beverage Containers.

(A case study of Lagos, Nigeria)

Master's Thesis
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Abstract of master's thesis

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Abstract

The reverse logistics of beverage containers is still in its formative stage in the city of Lagos. A significant number of consumers still discard the empties of beverage drinks indiscriminately despite that their residues can be reused as secondary materials in the packaging industry and other supply chains. Undoubtedly, waste collection is a common phenomenon among developing nations and this societal challenge has created a disconnection between the consumers of beverage drinks and the recycling industry that reprocess and reintegrate the beverage empties into supply chains.

On the part of Lagos state government and federal governments of Nigeria, much has not been done or achieved in curbing the act of indiscriminate disposal of used beverage containers. Government policies are currently not centered on the 3R of sustainable waste management i.e. reduce, reuse and recycle. Furthermore, the majority of producers of beverage drinks and the packaging industry are more interested in getting their products to the market rather than taking responsibility for the empties of their products.

This study combines different sources of data to analyze the situation of packaging and packaging waste in the city of Lagos and the outcome of the analysis was compared with the Finnish waste management system for the purpose of making recommendations on how to improve the waste management situation in Nigeria. A survey of consumers of beverage drinks was also conducted in Lagos and a video documentary on waste management in Lagos state was also considered in the analysis. In addition to the two research techniques, government legislations on waste management, personal observations and selected literatures that describe the reserve logistics hierarchy, the drivers of reverse logistics and the concept of consumers as material suppliers were used to develop a theoretical framework for this study.

The overall result shows that government has a major role to play in the reverse logistics of beverage containers by indirectly participating in the supply chain of producers through the enactment of legislations that addresses the issues of reduce, reuse and recycle (3R). Furthermore, the reverse logistics of beverage containers is a collaborative process that brings together all supply chain stakeholders including the actors of reverse supply chain (from packaging industry to the consumers) to work towards the accomplishment of same goal. Further, the consumers being the first link of the reverse supply chain must also be prepared to perform the responsibilities placed on their shoulders. The acceptance of their new role of material suppliers will go a long way in addressing the collection problems of used beverage containers in Lagos.

Keywords Reverse logistics, beverage containers, packaging, recycling, waste, legislation, 3R

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List of Abbreviations

3R - **Reduce, Reuse and Recycle**

EPR - **Extended Producer Responsibility**

EU - **European Union**

FEPA - **Federal Environmental Protection Agency**

GDPPW - **Government Decision on Packaging and Packaging Waste**

LASEPA - **Lagos State Environmental Protection Agency**

LAWMA - **Lagos State Waste Management Agency**

MSWM - **Municipal Solid Waste Management**

NESREA - **National Environmental Standards and Regulations Enforcement Agency**

PALPA - **Suomen Palautuspakkaus Oy**

PET - **Polyethylene Terephthalate**

PPWD - **Packaging and Packaging Waste Directive**

PRO - **Producer Responsibility Organization**

PSP - **Private Sector Partnership**

RLEC - **Reverse Logistics Executive Council**

RVM - **Reverse Vending Machine**

UBC - **Used Beverage Containers**

1 Introduction and Background of Study

Many years ago, prior to 1960 the society at large practiced sustainable consumption and waste management had not constituted a serious societal problem. Unlike nowadays where we live in the modern age where technology has influenced our lifestyles, consumption patterns and has even changed the dimension of waste generation. Usapein and Chavalparit (2014) assert that there are four sources of waste generation, namely, production, maintenance, waste treatment and waste packaging which is the focus of this study.

A significant number of consumer goods sold in the market today come with packaging materials such as plastics bottles, aluminum cans and glass bottles, and when these packaging materials are not handled appropriately after the consumption of the products, they constitute a waste of resources that does no good to the environment.

Waste is the product of human activities (Hasan, 2004, Garcia-Rodriguez et al., 2013) and is the most visible evidence of inefficiency in any system (Ezeah and Roberts, 2014). It can also be described as an evidence of life and where ever there is human activity, such place is bound to generate waste (Oresanya, 2016). The European directives 75/442/EEC and 2008/98/CE defined waste as “any substance or object which the holder disposes of or is required to dispose of”.

The last two decades was characterized by the unprecedented growth in world’s population (Mace et al., 2013; UNFPA, 2016) and within that period there have been increase in production activities and consumption level (Ezeah and Roberts, 2012; Memon, 2010). Furthermore, the volume of waste generation on one hand is proportionate to the economic activities and consumption level of people (Aarnio and Hämäläinen 2008) while on the other, is linked to urbanization and economic growth (Memon, 2010).

The term “waste” is relative in meaning and the substance or item that is perceived as waste in a society could be a source of secondary materials in another context. The differences in the perception of waste depends on the efficiencies or inefficiencies of the waste management authorities in discharging their duties to the people. Moreover, the existence of policies to curb the land filing of waste, and to channel waste to recovery facilities could also be a factor in the management of municipal solid waste. (Hasan, 2004)

Despite the fact that waste represent inefficiencies of the system and the by-product of human activities; it can also be a source of raw materials, energy and other resource (Abila, 2014). Packaging materials or beverage drinks containers such as plastic, glass and aluminum do

have some values incorporated in them after the contents of the containers have been consumed. These residues have to be collected from the point of consumption or disposal to the point where value will be added to them as secondary raw materials. Post-consumer products such as used beverage containers can only become a waste of resources when the residues or empties are not collected from the point of disposal and transported to the point where they are reused and integrated back into supply chains (Oresanya, 2016)

However, the neglect of post-consumer products by many manufacturers (Brown and Ferguson, 2001) and the indiscriminate disposal of post-consumer products particularly in developing countries are unacceptable behaviors which poses threat to the entirety of the society including governments at all levels of the society (Kofoworola, 2007; Memon, 2010). As a result of the increase in population and consumption level much pressure have been placed on natural resources (Mace et al., 2013) and the volume of waste generated have rapidly increased with a significant amount of the waste been buried on landfills (Da-Cruz et al., 2012). The more waste is being generated from the post-consumer phase of products the more resources are wasted and the more the natural resources from which the raw materials are extracted quickly diminishes if they are not used in sustainable manner.(Hyman et al., 2013)

The alarming state of municipal solid waste management which were worsen by the high volume of packaging waste, prompted policy makers in North America and Western Europe to deem it necessary to enact laws that will ensure environmental sustainability of packaging materials (McKerlie et al., 2006; Hanish 2000; Cardoso et al, 2013). The purpose of the measures is to compel producers to be more environmentally conscious and to take full responsibilities of the entire lifecycle of their products, especially in post-consumer phase where most waste occur. The same story cannot be said about developing nations as many are still struggling to provide the basic service of waste collection from households and so far about only 50% of households in developing countries are served by the local waste management authority (Stutz, 2008).

One of the oldest prohibitive laws and packaging legislations in the world is the Oregon bottle bill act of 1971. It was enacted at a time when indiscriminate disposal of waste was the order of the day and the city of Oregon and its water bodies were littered with empty beverage containers. The bottle bill was introduced to discourage eco-unfriendly behavior by the populace and to promote the reuse and recycle of used beverage containers (Cheng and

Chiou-nan, 2013). The bill charges both the consumers and producers of beverage drinks with the responsibilities of reusing used beverage containers rather than to discard them inappropriately. In the deposit based system, a mandatory deposit is on sold beverage drinks and the deposits are only refundable when the empty beverage containers are returned to the point of purchase or to the designated collection centres (Cheng and Chiou-nan, 2013).

In addition to the bottle bill act of 1971, there are other packaging waste legislations in Europe such as the German Packaging Ordinance (GPO), EU directives 94/62/EC and 2004/12/EC, and the Finnish government decision on packaging and packaging waste (962/1997). These legislations and couple of others will be further discussed in the next chapter. Other notable legislations that have demonstrated the impact of the Extended Producer Responsibility (EPR) policy and reverse logistics are, the EU Waste Electrical and Electronic Equipment (WEEE) directive 2002/96/EC and the amended directive 2012/19/EU. Both directives were introduced to make manufacturers of electrical products responsible for the retrieval of products at the end of their life cycle from consumers for the purpose of proper disposal, reuse, remanufacturing or recycling (Abdullah et al., 2014; McKerlie et al., 2006).

The implication of these directives on businesses is that manufacturers are now paying more attention to the environmental aspect of their businesses. Some businesses have even embarked on products and systems design in order to take post-consumer products into account (Spicer and Johnson, 2004). The alarming impacts of waste on nature can be curbed in various ways and can be done on a product by product basis (Spicer and Johnson, 2004).

One of the approaches of being environmentally conscious is through the integration of the traditional forward logistics with the Reverse Logistics (González-Torre et al., 2004). This practice integrates sustainability into supply chain by preserving the value of packaging materials for as long as possible by reusing and reintegrating used beverage containers back into the supply chain. Some scholars like (Kofoworola, 2007; Xuey and Chiou-nan, 2013) also emphasize the importance of supply chain sustainability and condemn wasteful habits.

In addition, Kocabasoglu et al., (2007); Gonzalez-Torre and Adenso-Diaz, (2006) opine that Reverse logistics (RL) was introduced in order to preserve the nature by reducing the demand for virgin materials and to reduce wastes disposal on landfills. Moreover, reverse logistics focuses on post-consumer waste which has some value in them that organizations can recover and reintegrate into the supply chain as new resource (Britto and Dekker 2003).

Lai et al., (2013) lists waste management, recycling, reuse, reprocessing, materials recovery and design as the methods of practicing reverse logistics. As table 1 illustrates, Rogers and Tibben-Lembke (2001) further categorizes products and packaging as the two important areas of reverse logistics and the set of activities that make up each area.

Table 1 Common activities of reverse logistics(Rogersand Tibben-Lembke, 2002)

Materials	Reverse Logistics Activities
Products	Products returned to supplier
	Resell
	Sell via outlet
	Salvage
	Recondition
	Refurbish
	Remanufacture
	Reclaim materials
	Recycle
	Landfill
Packaging	Packaging reuse
	Refurbish
	Reclaim materials
	Recycle
	Salvage

In the light of the advancement many western countries have achieved in the management of municipal solid wastes, especially on the collection and reusing of used beverage containers. Many developing nations are still struggling with the collection of municipal solid waste and despite all the environmental laws that exist in many developing countries a significant achievement have not been recorded in many developing nations (Ezeah and Roberts, 2014). Furthermore, businesses in developing nations are no exception, as many are yet to come to the realization that reverse logistics can be utilized as a strategic tool of competitiveness and environmental sustainability (Oko and Anayo, 2013).

1.1 Research Objectives

The aim of this study is to shed light on the current state of municipal solid waste management with respect to beverage containers of soft and alcoholic drink (recyclable glass bottles, aluminum cans and polyethylene terephthalate (PET) plastic bottles) in the city of Lagos will also be examined.

In addition to that, this research will also investigate the disconnection between the point of consumption/disposal of beverage drinks empties and the point where used beverage containers (UBC) are recovered, reused and integrated back into supply chains. It is logical that after consumption of beverage drinks, the empties should be discarded in an eco-friendly manner but in reality such is not the case in the city of Lagos. A significant number of used beverage containers are buried on landfills, dumped on road sides and even on water bodies, which are in no way adding value to the systems. As a result of the challenges of beverage containers collection in Lagos, a framework will be developed to sustainably manage the collection of used beverage containers in Lagos, Nigeria.

This study aims to further elaborate on the contrasting features about waste collection in the context of both developing and developed countries as presented in the proceeding section. More so, a comparative study of two countries that fall into the two different worlds on the issues of waste collection, the role of various stakeholders like governmental organizations and consumers will be examined.

Furthermore, this study will address the research problem through a comparative study of a top performing country that has the best practices of waste management designed in her system with a country that is overwhelmed with the challenges of waste management. Subsequently the following research questions will be answered using the same comparative approach:

1. What is the definition of reverse logistics in the context of used beverage containers?
2. What are the roles of consumers in the reverse logistics of beverage containers?
3. How has government policies affected organizations reverse logistics decision in Lagos, Nigeria?
4. How has government campaign or organizations' public awareness program promote the reverse logistics of beverage containers?

1.2 Methods and Case Studies

This academic work is a comparative study of Helsinki and the city of Lagos. It employs multiple sources of data to study the phenomenon from different perspectives and also to cross validate the data collected.

In order to accommodate different opinions and to view the topic from different lenses, a triangulation technique is employed for data collection. Ghauri et al., (1995) states that triangulation is the combination of methodologies in the study of the same phenomenon and to cross validate collected data. Triangulation combines both primary and secondary data and as such this study will combine data from questionnaire survey, video documentary, academic journals, waste legislations and public domain data to cross check and to validate the findings of this research.

Furthermore, the inefficiencies in the management of municipal waste in the city of Lagos and Nigeria would be identified as follows,

- Comparison of the waste management systems of both Lagos, Nigeria and Helsinki Finland
- Analysis of the supply chain of beverage containers in the city of Lagos.

Lastly, recommendations for improvement will be made on the identified gaps and it shall be based on the practices and standards that have helped Finland to move up on the waste disposal hierarchy.

1.3 The Justification for Selecting the Two Cities

The city of Lagos was selected as a case study because of it significant importance to Nigeria's economy. Lagos is the former capital and the economy hub of Nigeria, and despite its status, used beverage containers continues to constitute nuisance on streets and water bodies of Lagos. In addition, in terms of municipal solid waste management (MSWM), Lagos remains the pacesetter in the country and a learning point to other state in Nigeria (Ezeah and Roberts, 2014).

However Lagos is yet to find a lasting solution to the empty aluminum cans, PET bottles and plastic sachets that are littering and defacing the city of Lagos. It is illogical to discard any item or substance that still has some value or that can be reused as raw materials (Cheng and Chiou-nan, 2013) but that is not the case of empty beverage containers in the city of Lagos.

Lagos generates 9,000 metric tons of waste daily (LAWMA, 2016) which includes used beverage containers and there is high possibility that some of these waste are carelessly disposed - of or are not completely collected from households by LAWMA employees.

The situation in Helsinki, Finland is contrast to that of Lagos in Nigeria. Finland is one of the most sustainable countries in the world and is one of the places where the take back program of beverage containers has been successfully implemented with 1.7 billion of beverage containers been recycled yearly (PALPA, 2016). The circular economy of beverage container in Finland has helped in promoting environmental sustainability through the recycling and reusing of beverage containers. The recycling industry in Finland has created jobs and all stakeholders are involved in the sustainable management of waste. (Helsinkitimes, 2014)

Though, from all parameters the city of Lagos cannot be compared directly with Helsinki in terms of sustainable waste management but the policies, prohibitive measures, collection process and consumers' attitude to waste management are elements that are worthy of emulation and should be a learning point for policy makers in Lagos.

Furthermore, the researcher has had a taste of the two cities, having lived most of my life in Lagos and now studying in Helsinki gives me access to information and the practicalities of waste management in both countries.

1.4 Structure of the Thesis

The structure of this research work is illustrated in the diagram below.

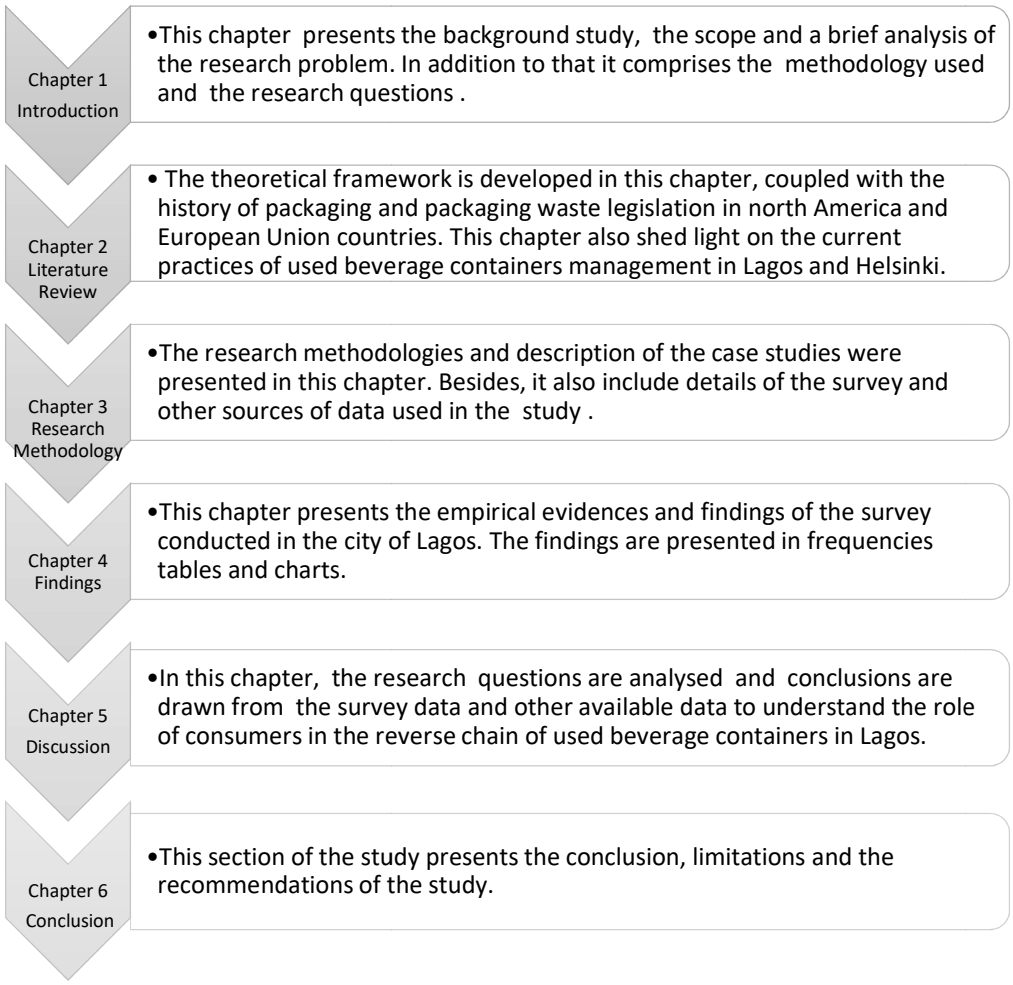

Figure 1 The structure of the thesis

2 Literature Review

In this chapter the concept of reverse logistics is defined from the point of view of value recovery, reuse and the reintegration of used packaging waste back into supply chains. The second part of this chapter will explain the different packaging and packaging waste legislations in Europe and the motivations behind the first packaging law enacted in Europe. Additionally, the theoretical framework will be developed in the third part using theory and concepts from previous literatures and waste management legislations. The last part will shed light on the management of beverage container deposit system in Finland and the management of municipal solid waste in the city of Lagos.

2.1 The Definition of Reverse Logistics in the Context of this Study

Reverse logistics has evolved over the years and its definition too has changed from time to time depending on the context it was used. The reasons for practicing reverse logistics varies from industry to industry (Chan et al., 2012; Krumwiede and Sheu, 2002) and it has been practiced in industries like photocopiers, single-use cameras, jet engine components, cellular telephones, automotive parts, computer parts, steel, chemical, pharmaceuticals and refillable containers (Ravi et al., 2005; Dowlatshahi, 2000).

Regardless of the industry that reverse logistics is being practiced they all share a common goal of resources preservation through value recovery and reduction in the volume of waste that ends up on landfills. (Kocabasoglu et al., 2007)

Reverse logistics is defined as the "Movement of goods from a consumer towards a producer in a channel of distribution" (Pohlen and Farris 1992). The study is one of the pioneer literatures on reverse logistics and emphasis is placed on recycling as a viable option to land filling of waste and the distribution channel of reverse logistics. Carter and Ellram (1998) defined reverse logistics from the environmental perspective as a process whereby companies can become more environmentally efficient through recycling, reusing and reducing the amount of materials used. The study further developed a comprehensive framework after concluding that reverse logistics literatures that were available prior to 1998 were either focusing on recycling or do not have a comprehensive conceptual framework.

"Reverse logistics encompasses the logistics activities all the way from used products no longer required by the user to products again reusable in the market" (Fleischmann et al.,1997). This study was conducted from the point of view of operations research and with

emphasis on waste reduction and reusing of post-consumer products via logistics activities of distribution planning, inventory management and production planning.

At a time when reverse logistics was still at the infancy stage, Stock (1999) highlighted the inability of organizations to devote enough time on planning, implementing and controlling of reverse logistics activities as factors responsible for their inability to achieve optimal performance.

Rogers and Tibben-Lembke (1998) defined reverse logistics as "the process of planning, implementing, and controlling the efficient, cost effective flow of raw materials, in-process inventory, finished goods and related information from the point of consumption to the point of origin for the purpose of recapturing value, or proper disposal". This definition is an elaborate one and is often used by scholars such as (Chan, 2007, Tibben-Lembke, 2002). The literature further explains that remanufacturing and refurbishing activities may be part of the definition of reverse logistics. In contrast to (Rogers and Tibben-Lembke, 1998), Fleischmann et al., (1997) stated that products do not return to the original manufacturer of the products and instead they are reintegrated into other supply chains.

However, Bernon and Cullen (2007), Bernon et al., (2011) and De Brito and Dekker (2003) argued that post-consumer products do not only return to their point of origin, they could also be channeled to designated recovery centers.

Spicer and Johnson (2004) further corroborated De Brito & Dekker's (2003) position by stating that, original equipment manufacturer (OEM) take-back, third-party take-back and pooled take-back are the three approaches producers can perform extended producer responsibility. The definition of (Rogers and Tibben-Lembke, 1998) is ideal for a closed-loop supply chain where the original equipment manufacturer solely undertake the take back of its products from consumers after their useful end of life.

Thienen et al., (2014) adopted the Reverse Logistics Executive Council's (RLEC) definition of reverse logistics, as "the process of planning, implementation and controlling backward flows of raw materials, in process inventory, packaging and finished goods, from a manufacturing, distribution or use point, to a point of recovery or point of proper disposal". The definition of reverse logistics executive council clearly addressed the issues of point of origin and the point of recovery that was raised by (Britto and dekker 2003) in the (Rogers and Tibben-Lembke, 1998), and also acknowledged packaging as one of reverse logistics materials. Pohlen and Farris (1992) also stated that recyclable materials do not necessarily

flow backwards through the same supply chain that supplied the goods but what is of prime importance is that recyclable materials are remanufactured into recycled products. Further, RLEC's definition of reverse logistics accommodates the position of Pohlen and Farris (1992) on the backflow of recyclable materials by considering both the open and closed loop supply chains in the end of life phase of products.

In conclusion, the definition of reverse logistics by the Reverse Logistics Executive Council is considered the most suitable for this study and particularly for the reverse logistics of used beverage containers based on the analysis on the preceding paragraphs of this section.

2.2 Packaging Waste Legislations in European Countries

This section of the study will look into the genesis of packaging waste and the legislations that were enacted to address the challenges of packaging waste in the society.

2.2.1 The German Packaging Ordinance

Prior to the enactment of the packaging ordinance, there was the Wastes Avoidance, Recycling and Disposal Act (WARD) of 1986, and its strong point was the implementation of waste management hierarchy of avoidance, reuse and recycling to the German society. The practice was embraced by many households(OECD, 1998) and in Spite of people's positive attitude towards the Wastes Avoidance, Recycling and Disposal (WARD)Act of 1986, packaging wastes in Germany still accounted for 30 percent of municipal solid wastes by weight and 50 percent by volume (McKerlie et al., 2006; Hanisch 2000).

The failure of existing regulations to achieve a significant reduction in packaging waste that end up on landfills was the reason that prompted the enactment of packaging ordinance of 1991. The ordinance shifted the cost of managing packaging wastes from the government to producers, and this act alone paved the way for the introduction of a more sustainable and eco-friendly packaging design by producers(McKerlie et al., 2006; Hanisch 2000).

The German packaging ordinance came into force in June 12, 1991 at a time when there was shortage of landfills in Germany. The legislation was introduced to reduce the amount of packaging materials that end up on landfills by compelling producers and distributors of packaged goods to take back the packaging waste of the products they sold to consumers. Producers of packaged products are required by law to either take back packaging waste of their products individually or to join Duales System Deutschland (hereinafter, DSD)

(McKerlie et al., 2006; OECD, 1998). DSD is a producer responsibility organization that is charged with the responsibility of collecting, sorting and recycling of packaging wastes on behalf of producers and distributors.

The process of using DSD collection systems usually begins with the producer paying an annual license fee to DSD in order to use the green dot label, and this fee is determined by the recyclability, volume and the weight of the packaging wastes of the products a producer placed in the market (McKerlie et al., 2006). OECD (1998) states that producers that do not belong to the DSD collection system are mandated to report the amount of packaging wastes generated and provide evidence that the wastes are handled in the manner approved by the ordinance.

2.2.2 European Union Packaging and Packaging Waste Directive (PPWD) 94/62/EC

The EU Packaging and Packaging Waste Directive (PPWD) 94/62/EC and Directive 2004/12/EC that was adopted in December 20 1994 and amended in February 11, 2004 respectively were introduced to make manufacturers and suppliers of packaging materials to be accountable for the packaging waste of products they introduced to market.

These legislations also emphasize on recovery, reuse and recycling rather than the outright disposal of packaging waste. According to Da-Cruz et al., (2012); Baughan and Frekko (2004) both directives are legislative measures aimed towards establishing a harmonized best practice among European Union countries. Moreover, the directives requires member states to reduce the impact of packaging waste on the environment through eco-friendly packaging design and the introduction of a recycling program which will involve all stakeholders in the recovery, reuse or recycling process.

The EU directives did not only set the requirements and targets that member states must work towards but members states must include the directives in their national policies and timeframes were also set for accomplishment of each milestone. For instance directive 2004/12/EC demands a minimum recycling target of the following packaging wastes as table 2 indicates before 31st December 2008:

Table 2 Recycling target (EU directive 2004/12/EC)

Materials	Percent
Glass	66%
Aluminum	50%
Plastic	22.5%

Besides, both directives emphasize on the need for member states to implement information systems in order to monitor and report the progress of the implementation of the directives. Directive 94/62/EC also charged member states with the responsibilities of putting mechanisms in place that will ensure smooth return and collection of packaging wastes.

2.2.3 Finnish Laws on Packaging and Packaging Waste

This section of the thesis will shed light on the policies that were put in place to promote the principle of EPR in the Finnish society. Finland is one of the European Union countries that have implemented the policy of Extended Producer Responsibility (EPR) on packaging and packaging waste. The EPR is an environmental strategy that is employed to reduce the negative externalities of business on the environment.

2.2.3.1 Waste Act (646/2011 and Amendment 528/2014)

The act cuts across different categories of waste but the one that is relevant to this study is the packaging and packaging waste. The packaging and packaging waste section of the act is more or less compliance to the EU directive 94/62/EC which mandated member countries to ensure that the directive reflects in their national law.

Section 72 of the act forbids the littering of waste in the environment and further charges all stakeholders on the obligation to keep waste separate in order to promote their reuse and not constitute a threat to public health and safety. In addition, section 62 of the act also set conditions for the formation of producer responsibility organization and also stated how a producer fulfill its producer responsibility by joining a return system which act on their behalf to fulfill their environmental responsibility.

Under section 68 of the act, producers or importers of beverage containers can either individually or jointly establish a deposit return system for collection of empty containers and to fulfill the take back responsibility imposed on them by the law. It is not mandatory for all

producers to establish a deposit return system of their own, and rather than set up a new one producers can join an existing deposit system to fulfill their constitutional obligation. Furthermore, beverage distributors are obliged to collect used beverage containers from consumers and this responsibility confers a dual role on the distributor which is a distributor of goods to consumers and also the supplier of resource to producers.

2.2.3.2 Act on Excise Duty on Certain Beverage Packages

The act on excise duty on certain beverage containers was introduced in Finland on January 1st, 2005. The act is one of the legislative measures to promote the recovery of packaging waste and to protect the environment. There is financial incentive in form of tax exemption for producers, packers and importers of soft or alcoholic drinks that have plans of recovering used beverage packages through deposit return system. However beverage containers that are not part of the deposit return system or non-returnable containers are charged a packaging tax of 0.51 cents per liter as the cost of environmental externalities and the recovery of the containers. This form of taxation is aimed towards discouraging wasteful culture by stakeholders and to channel beverage empties from consumers to different supply chains for the purpose of refilling, recycling and remanufacturing of new products (YMPARISTO, 2016).

2.2.3.3 Government Decision on packaging and Packaging Waste (962/1997)

This decision came into existence on October 23, 1997; and it is a more or less a compliance of EU directives 94/62/EU and 2008/98/EC. The legislation set the obligations for all stakeholders and guidelines for the smooth implementation of the waste management hierarchy as prescribed by directive 2008/98/EC. Another strong point of the law is the responsibilities of taking back packaging wastes from the consumers that is placed on producers and packers of packaged products. However, producers can delegate this responsibility by joining a consortium of producer responsibility organization, which is an organization that acts on behalf of members in the collection and recovery of packaging wastes. The decision also stipulated the minimum material recovery target and a deadline of June 30, 2001 were set for the achievement of the following: reduction of packaging waste at 6%, reuse at 82%, recovery at 31% and recycling of packaging waste at 2%. Moreover, the legislation also prescribed the recycling of 48% of glass, 25% of aluminum and 45% of plastic must be recycled before the end of June 2001.

Furthermore, the law promotes the usage of eco-friendly packaging designs and materials for products and also stipulates that manufacturers should adequately inform consumers on the procedures for collection of packaging wastes. All stakeholders are also compelled to report the quantity of packaging wastes retrieved from consumers to the Finnish Environment Institute for the purpose of monitoring the achievement of the set goals.

2.2.4 The Finnish Beverage containers Deposit Return System

Suomen Palautuspakkaus Oy (hereinafter,PALPA) is a producer responsibility organization, established in 1996 to oversee the return of aluminum cans for recycling and it is the largest operator of deposit-based return system in Finland. In the year 2008 PALPA's service was extended to include PET bottles. PALPA is owned by large retailers and breweries in Finland and it perform the functions of collection, recycling and promoting the reuse of used beverage containers on behalf of the owners.

Producers and importers of beverage packages can only transfer their environmental responsibility to PALPA after the payment of subscription fees and recycling fees which depends on the packaging materials. A registered producer or importers of beverage packages are allowed to use PALPA marks which are either printed directly on the beverage container or on the product's label. Information about the deposit and the beverage containers are embedded on the marks and they are recognizable and readable by PALPA's reverse vending machines.

PALPA utilizes different channels for the collection of used beverage containers from consumers. In the case of refillable glass bottles which are usually returned to breweries in crates, are either returned directly by customers or they are being picked up from customers or retailers by the same suppliers that supplies the products. The Reverse Vending Machine (RVM) is another channel for the collection of beverage empties and they are usually located in accessible centers like grocery stores for consumers' easy return.

In Finland, there is a mandatory deposit on every unit of beverage drinks sold in beverage packages. The deposits serve as incentives for consumers to return empty beverage containers to the manufacturers of containers via the RVM available in retail outlets. On the return of the beverage empties the RVM issues a receipt that acknowledge the monetary value of empties returned and the receipts are redeemable at the same grocery store the containers are returned.

The Finnish society has a culture of household waste separation and children are taught about recycling and waste separation right from childhood both at home and in schools. Majority of residents in Finland have positive attitudes towards the returning of used beverage containers and in the preservation of the environment. According to (PALPA, 2016) Finland has a high return rate on beverage containers and so far, an impressive 95% of aluminum cans are recycled, 98% of refillable glass bottles are reused, 93% of plastic bottles and 89% of recyclable glass bottles are recycled.

Suomen palautuspakkaus Oy PALPA is one of the producer responsibility organizations in Finland charged with the responsibility of managing the post-consumer phase of packaging products. Others are illustrated in Table 3 with the packaging materials they are responsible for.

Table 3 Approved producer organization for packaging products (YMPARISTO, 2016)

	Organizations	Materials
1	Mepak-Recycling Ltd	Metal
2	Puupakkausten Kierratys PPK Oy	Wood
3	Suomen Kerayslasiyhdistys Ry	Glass
4	Suomen Kuitukierratys Oy	Fibre packaging
5	Suomen Palautuspakkaus Oy PALPA	Deposit beverage packaging
6	The Finnish Plastics Recycling ltd	Plastics

2.3 Process Analysis of the Finnish Deposit Return system for Beverage Containers

The supply chain of beverage containers begins from the producers of beverage drinks who produce and distribute the products through the suppliers to businesses and retail outlets. However before the products are distributed to the market, recycling fees are paid by the producers on every unit of beverage produced to PALPA, who oversees the collection of used beverage containers from consumers. On the receipt of the supplies from suppliers, the retail outlets or stores pays the producers the deposits on the beverages delivered to them (LAWMA, 2015).

Additionally, the consumers who are the links between the forward and reverse logistics buy soft and alcoholic drinks from the retail stores while paying deposits indirectly on every unit

bought. Nevertheless, the deposits are returned to the consumers provided the beverage empties are returned to the stores or directly to PALPA by business customers. As illustrated in figure 2, PALPA coordinates the movement of beverage containers in the supply chain by providing a platform where stakeholders can interact with one another, thereby closing the supply chain of beverage containers in Finland.

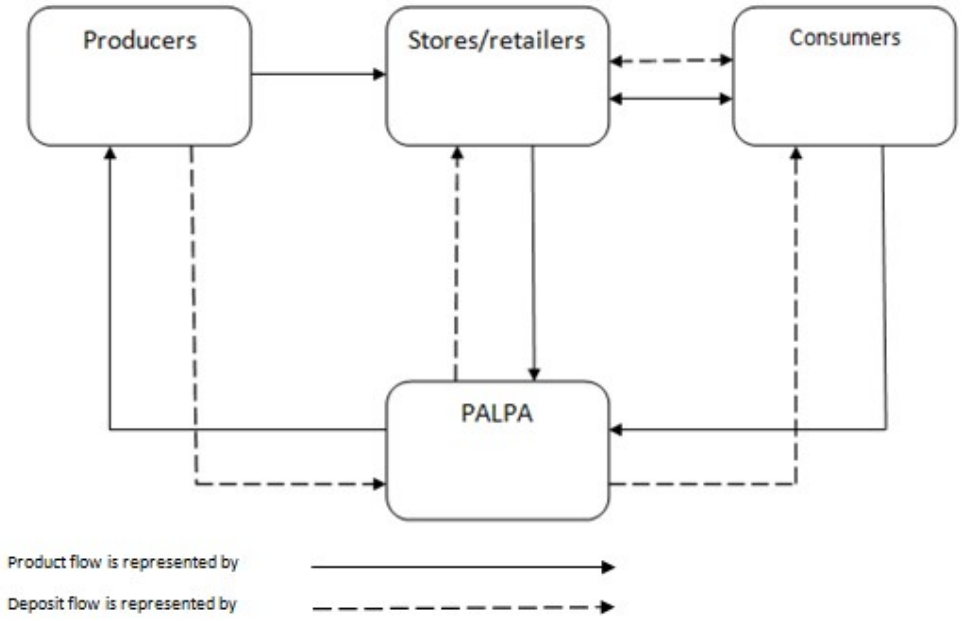

Figure 2 The flow of beverage containers and deposits in the Finnish market

2.4 Status of Solid Waste Management in Developing Countries

Municipal solid waste management has evolved over the years in many developed countries and most of the success recorded in this sector was due to the continuous review of environment policies by the appropriate authority. However, the situation is not the same in many developing nations. Solid waste management in most developing countries is in a crisis situation and the unsustainable rate at which waste and population grow, further complicates the situation by making waste management a challenge for government at all levels. (Ezeah and Roberts, 2014; Ogwueleka, 2009)

The problem of poor waste management is more prominent in urban areas of developing countries and this is as a result of the high rate of rural-urban migration (Imam et al., 2008), improvement in lifestyle and increase in income and consumption(Ogwueleka, 2009; Abila, 2014).

Municipalities in developing countries spend as much as 20-50% of their recurrent budget on solid waste management and despite the budgetary allocation on waste management less than 50% of the inhabitants are served while 30-60% of the urban solid waste is left uncollected (worldbank, 2016; Stutz, 2008). The inefficiencies of waste management authorities in many developing countries have led to the inappropriate disposal and burning of municipal solid waste by communities that are denied of the services of the waste management authorities.

In most developing countries, there exist the informal sector and they are popularly called different names like scavengers, waste pickers, garbage pickers or cart pushers (Brix-Asala et al., 2016). In communities where the formal sector i.e. the waste management authority could not provide services, cart pushers step in to provide an alternative to the people by collecting waste from household to household for a fee.

The inadequate funding and lack of technical support have rendered many waste management authorities in sub-Saharan African Countries inefficient and have limited their capabilities to the collection and disposal of waste on landfills. The disposal of municipal solid waste on landfills is considered less expensive and less eco-friendly compared to other options of waste management that are practiced in developed nations. Moreover, Recycling activities in many developing countries is usually done by agents of the informal sector that are popular known as scavengers, waste pickers or waste collectors, who picks valuable materials from landfills and sell to the recyclers .(Stutz, 2008)

An average informal waste collector performs the function of sorting of mixed waste by separating the recyclables from other types of waste in the open dumpsite before the recovered items are sold to the recyclers. However, the activities of the informal waste collectors have received disapproval from different quarters because of the inappropriate method they dispose collected waste and the unhygienic manner they conduct their businesses. (Oguntoyinbo, 2012)

Unlike many developed countries that have successfully utilized legislations and consumers demand for eco-friendly products to drive sustainable business practices and waste management systems. According to Ezeah and Roberts (2014) environmental and waste management laws in Sub-Saharan Africa countries failed to achieve their intended purpose because of implementation problem.

2.4.1 Packaging Waste Legislations in Nigeria

The history of environmental policies and waste management in Nigeria is dated back to 1987 after the discovery of toxic waste that was dumped in the Niger delta area of Nigeria. This discovery prompted the Nigerian government to establish the Federal Environmental Protection Agency (FEPA) in the year 1988 and by 1999 the Federal Ministry of Environment (FME) to perform and absorb the functions of FEPA. The National Environmental Standards and Regulation Enforcement Agency (hereinafter, NESREA) were established in 2007 under the supervision of the Federal Ministry of Environment, Housing and Urban Development. NESREA was established by an act of the parliament to oversee all environmental related issues in Nigeria and to repeal the decree that led to the establishment of FEPA. (Ezeah and Roberts, 2014; Ijaiya and Joseph, 2014)

The problems of empty beverage containers in the Nigerian society began in the tail end of last century and the existing environmental laws and regulations as at that time do not cater for this kind of problems. There have been different environmental laws and policies on waste management in Nigeria but there has not been any national law or policy on sustainable waste management (Afun, 2009). According to Abila and Kantola (2013) waste management policies in Nigeria are weak, obsolete, poorly implemented waste management and are not revisited or review to reflect the reality on ground.

Osibanjo (2016) also opined that the absence of government waste policies particularly the ones that compel producers to use recycled products, as the reason why many stakeholders still perceive many recyclable materials as waste. And as a result of the absence of sustainable waste management policies, packaging producers have shown little or no interest in the management of packaging waste. Likewise the consumers that are supposed to be suppliers of secondary materials do not play any role as far as the reverse logistics of beverage containers is concerned (Abila and Kantola, 2013; Oko and Anayo, 2013).

2.5 The Situation of Used Beverage Containers in the City of Lagos

Waste management in some developing countries has really improved but not in the same level as their counterparts in developed nations (Courtois, 2012) and much success has not been achieved in the backward flow of used beverage containers.

In the recent past, Lagos state government has undertaken some reforms to restructure waste management in the city of Lagos. The reform did not only reposition Lagos state Waste

Management Authority (LAWMA) to deliver better services, it has also attracted both foreign and local investors through Public-private partnership (PPP) and Private sector participation (PSP). Other outcome of the reform are, the acquisition of waste management equipments, the reduction of landfills from 16 to 5 and the establishment of composite and recycling facilities within the city of Lagos (Ezeah and Roberts, 2014; LAWMA, 2016).

In Nigeria there is no known producer responsibility program or government policies for collection of used aluminum cans, PET bottles and plastic sachet from consumers neither is any incentive for consumers to return empty beverage containers. Aluminum cans and PET bottles do not have any other conditions attached to their sales aside from the payment of the cost price which also include both the beverage and the container. The absence of reverse logistics or agents for collection of aluminum cans and PET bottles by producers of beverage drinks or government has taken a heavy toll on the environment in the city of Lagos and not even waste pickers, LAWMA or the PSP operators could do much to change the situation. As the streets, highways, roadsides, water bodies and drainages are all littered with empty beverage cans and plastics (Oko and Anayo, 2013; Appendix D).

Unlike aluminum cans and PET bottles, the supply chains of many producers of refillable glass bottled drinks in Nigeria have reverse channel for collection of used glass bottles from consumers. The collection process and channel has been in operation for many years and it requires consumers to present empty glass bottle of the same brand and quantity they intend to buy before any exchange can take place. This condition is also applicable to all actors in the distribution channel, and it is mandatory that distributors, wholesalers and retailers must own crates of empty glass bottles for exchange with filled glass bottled drinks in the course of receiving supplies from the producers of beverage drinks (Oko and Anayo, 2013).

The alternative for bottles exchanges in the course of buying drinks is that consumers have to deposit a certain amount of money before they can buy glass bottle drinks and the deposits are refunded on the return of the empty glass bottle of the drink bought. The empty glass bottle flows backward to the producers through the same forward logistics channel that supplies the products.

The recovery of aluminum cans and PET bottles in the city of Lagos is a bit complicated and most of the recycling activities depend on the efforts of agents of the informal sector. Most waste management departments in developing nations are incapacitated by financial constraints and as a result waste management authorities in cities of developing nations like

Lagos focuses on the collection and disposal of waste on Landfills while the waste pickers and scavengers perform the recovering of recyclable materials such as aluminum cans, glass bottles and PET bottles from the waste stream (Abila and Kantola, 2013; Stutz, 2008).

2.5.1 Collection and Recycling of Used Beverage Containers (UBC) in Lagos

The Lagos state waste management authority (LAWMA) has a buy-back program for recyclable materials where the informal sector agents can sell the recyclables they recovered from landfills for a token amount as depicted in table 4, to the authority. The buy-back program is unpopular among households and the buyback-centers are located in Olushosun landfill site and Oyingbo buy-back center which realistically cannot serve a population of about 17 million people.

In addition, there are 8 mini recycling banks located within the city of Lagos but these banks are only for collection of empty beverage containers as shown in appendix C. These mini recycling banks could be a turn on for households in the vicinities of the recycling banks to return used beverage cans for recycling.

Furthermore, a couple of small and medium enterprises in the city of Lagos operate as waste buyers and their approach is door to door collection of recyclables like PET bottles, glass bottles and aluminum cans in exchange for financial incentives, food stuffs or gift items (bbcnews, 2014; Wecyclers, 2016). Aside from the door to door collection, waste buyers do buy recyclable waste from waste pickers which they sort into different material types before they are sold to users in the formal sector of the economy (Brix-Asala, et al., 2016).

However, the activities of the waste buyers is still limited to few households in the city and considering the growing population and consumption level of people in Lagos state, there is still much to be done in the retrieval of used beverage containers from end consumers.

Table 4 Buy-back price (LAWMA, 2016)

	Recyclables	Price	
		₦/KG	€/KG
1	LDPE nylon	₦30:00	€0.0965547
2	PET bottles	₦20:00	€0.0643465
3	Breakable bottles	₦5:00	€0.0160863
4	Cartons	₦5:00	€0.0160863

The conversion of Naira to Euro was based on the exchange rate available on the website of XE currency converter www.xe.com of Monday June 27, 2016. (€1: ₦ 310.824)

2.5.2 Analysis of the Supply Chain of Beverage Containers

The supply chain of beverage containers in the Nigerian market begins with the suppliers of raw materials who source for raw materials that are used in the production of beverage containers. Unfortunately the chain ends with the consumers of beverage containers because of the challenges of collecting beverage empties after consumption. A significant number of used beverage containers are discarded inappropriately in the city of Lagos daily and there is no clearly defined waste management plans either by the government or the packaging industry for the collection and reuse of UBC (Abila and Kantola, 2013).

Consequently, the absence of sustainable waste management program on packaging waste has created a gap in the circular flow of packaging materials and thereby resulted in the disconnection between the consumers and the recycling industry that converts beverage empties into useful resources. The disconnection between these two stakeholders has led to the emergence of the agents of the informal sector, popularly known as scavengers or waste pickers. The waste pickers are motivated to perform recycling activities because of the value inherent in used beverage containers which offers them a means of livelihood.

Figure 3 below illustrates the flow of beverage containers in the city of Lagos and the possible channels that empty containers can be retrieved from consumers for another productive use.

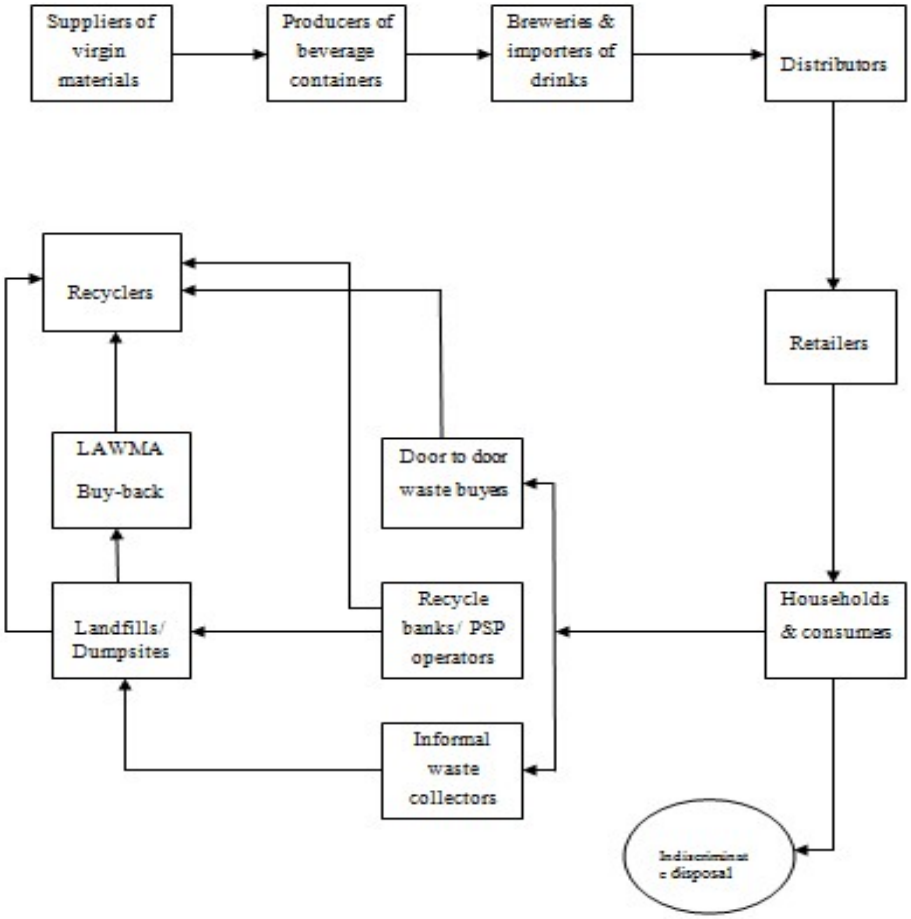

Figure 3 The current collection system of used beverage containers in Lagos

2.6 Mapping of Theoretical Framework

The theoretical framework of this study is based on the interaction of three different concepts and they are as follows:

1. The reverse logistics hierarchy/ waste disposition hierarchy theory (3R), Carter and Ellram 1998; EU directive 2008/98/EC)

Article 4 of EU directive 2008/98/EC prioritized the order of waste management as illustrated in figure 4.

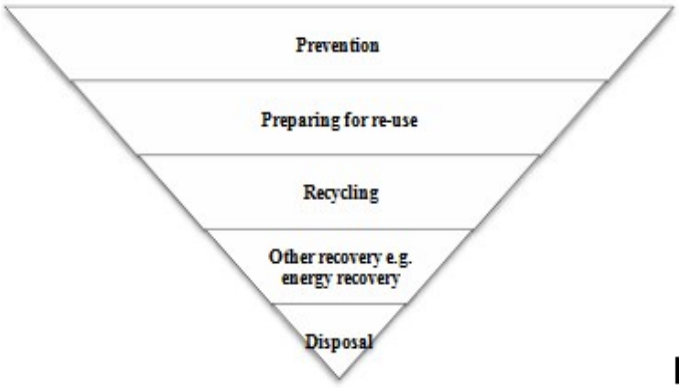

Figure 4 EU directive 2008/98/EC

In addition Carter and Ellram (1998) opined that "reverse logistics is the process whereby companies can become more environmentally efficient through recycling, reusing and reducing the amount of materials used.

2. The drivers of reverse logistics theory (De Brito and Dekker, 2003; Akdogan and Coskun, 2012)

   "The drivers of reverse logistics activities, three main factors can be classified as the drivers of RL which are economics, legislation and corporate citizenship" (Akdogan and Coskun, 2012) pp. 1640

   Further, De Brito and Dekker (2003) adopted a framework titled the driving triangle of reverse logistics which is illustrated in figure 5, to highlight the motivation for reverse logistics adoption.

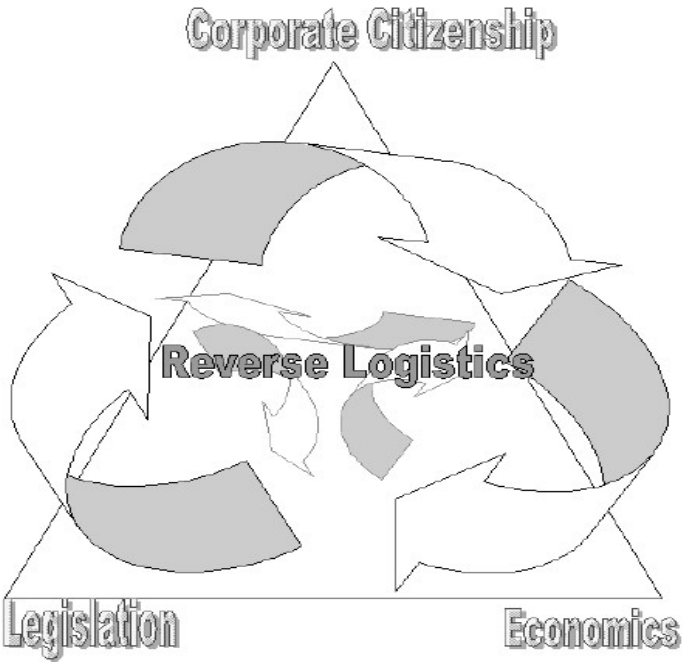

Figure 5 Driving triangle for reverse logistics (De Brito and Dekker, 2003)

3. Consumers as material supplier concept (Gonzalez-Torre and Adenso-Diaz, 2006). This particular concept is the author's initiative to describe the importance of consumers in the reverse supply chain of beverage containers. Moreover, it is supported with extract from the work of Gonzalez-Torre and Adenso-Diaz (2006) ;(2002).

   "Customer is the first link in the reverse supply chain, and his or her behavior with respect to separating household waste is essential in order to close the circle" (Gonzalez-Torre and Adenso-Diaz, 2002 p. 399)

   " For the reverse flow to function properly, it is essential for consumers to return the product once it is no longer used and companies have to assume the alternatives of recovering these returns" (Gonzalez-Torre and Adenso-Diaz, 2006 p. 531)

The interaction of the components of the above theoretical framework is illustrated in figure 6 and the subsequent sections of this chapter discuss the concepts.

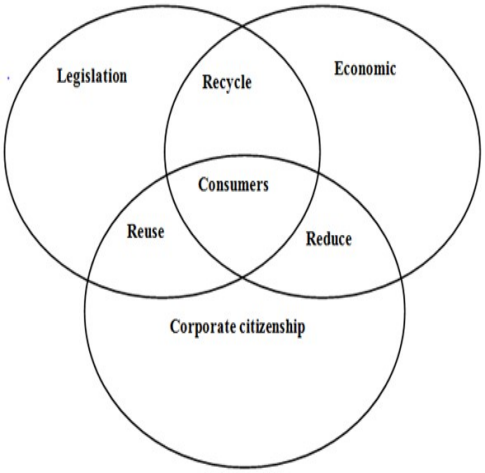

Figure 6 The reverse logistics framework of beverage containers

2.7 Reverse Logistics/ Waste Disposition Hierarchy (3R)

Carter and Ellram (1998) emphasizes that reduce, reuse and recycle (3R) are the three approaches of becoming environmentally efficient. Some scholars such as (Memon, 2010; Van Hoek, 1999; Mandaraka and Kormentza, 2000) also agreed with the position of (Carter and Ellram, 1998) which states that the 3R approach are the most sustainable means of managing municipal solid waste. The reverse logistics hierarchy as shown in figure 7 is similar to the wastes management hierarchy prescribed in EU directive 2008/98/EC which prioritized prevention, reuse and recycle over landfill disposal. Ewijk and Stegemann (2016) emphasizes that the hierarchy is a priority order for at least three waste management options. Moreover, Usapein and Chavalparit (2014) also describe the 3R as the hierarchy of waste management that is employed to manage increasing waste generation and to achieve a zero waste or zero land filling goal.

Many organizations believe that the process of reverse logistics begins with recycling, whereas the process actually began from the early stage of product design, process design and packaging design (Cullen et al., 2010). The prevention of waste from the design phase does not only reduce materials usage, it also minimizes the volume of waste from generation to disposal (Carter and Ellram, 1998; EU directive 2008/98/EC). Aside from the EU directives and some national laws that promotes the reduction, reuse and the recycling (3R) of packaging waste; some scholars have also shed light on the 3R and even went a step further by relating it with other concepts.

Memon (2010) described the terms; Reduce, Reuse and Recycle as the 3R approach of wastes management, and incorporated the 3R with the concept of Integrated Solid Wastes Management (ISWM) to optimize the management of solid wastes from all wastes generating sectors. Bernon and Cullen (2007) also incorporated elements of the 3R with three management approach namely, integration, collaboration and evaluation to manage post-consumer returns.

2.7.1 Reducing of Packaging Waste

The reduction of packaging materials occupies the top of the waste disposition hierarchy and this is best done at the developmental stage of product's lifecycle. Any decision pertaining to packaging designs, product design or process design that was taken at the development stage of the product will have reverse logistics implications throughout the product's lifespan (Tibben-Lembke, 2002). Reducing entails the minimization of packaging materials at source and the design of environmental friendly packages for products to facilitate smooth reuse or recovery of packaging materials (Carter and Ellram, 1998).

Reduction of packaging waste at source has been classified into qualitative and quantitative. The qualitative reduction is the total elimination or the reduction to the barest minimum of any eco-unfriendly or toxic substances from packaging waste. While the quantitative source reduction of packaging materials comprises of the design of a long lasting product, and the using of lightweight packaging materials that will greatly reduce the volume of packaging waste generated at every stage of the product's lifecycle (Mandaraka and Kormentza, 2000).

Furthermore, the obligations of packaging waste management is placed on the packaging industry (Da-Cruz et al., 2014; Eichstadt et al., 1999) and this responsibility incentivize the players in packaging industry to design lightweights packaging with high reusability and recyclability level and which are of acceptable standards to all stakeholders.

2.7.2 Reusing of Packaging Materials

The reusability of empty beverage containers in this context refers to the ability to directly reuse used beverage containers without putting them through any materials recovery process. Reuse is described as "any operation by which packaging is designed to accomplish within its lifespan a certain number of repeated uses, or is refilled or reused for a purpose similar to its original purpose, irrespective of whether auxiliary products are present on the market enabling the packaging to be refilled; such reused packaging becomes packaging waste when no longer in use" (EU directive 94/62/EC; GDPPW/962).

The reusing of packaging materials is the second best option on the hierarchy of waste framework after the prevention of waste via reduction (EU directive 2008/98/EC). Packaging reusability is best done also when provision has been made for its reusability in the design phase of the product. It also entails the logistics involved in returning used beverage containers or glass bottles to the place of production, where they are washed and refilled in an environmentally sound manner that do not compromise public health. Glass bottle is a typical example of reusable materials, they are 100% reusable through bottle refilling (Tibben-Lembke, 2002) and some plastic bottles are also refillable. The reusing of packaging materials afford organizations the opportunity to save cost on raw materials and helps to preserve nature (Mandaraka and Kormentza, 2000; EU directive 94/62/ec).

2.7.3 Recycling of Packaging materials

The recycling of beverage containers is a better alternative and constitutes a lesser environmental burden compared to land filling or incineration of beverage containers. In the case of packaging materials that are not designed for reuse, recycling still remains the viable option to recover the value in them. However, the recycling of beverage containers is easier when the packaging material is designed to be recyclable right from the developmental phase of the product. (Mandaraka and Kormentza, 2000) The recycling of packaging materials reduces waste and conserves natural resources and energy that would have been utilized in the extraction and conversion of virgin raw materials into a useable form (Coelho et al., 2011; Ezeah et al., 2013).

In addition, recycling afford producers of beverage containers the opportunity to generate secondary raw materials from used containers, which can substitute primary raw materials for the production of new packaging materials or reintegrated into other supply chains to produce goods like glass wool, cellular glass, textiles, umbrellas, bicycle wheels and kitchen utensils (Barrera and Cruz-Mejia, 2014; PALPA, 2016; Coelho et al., 2011). Besides the conservation of natural resources, recycling also create job opportunities for the employed. However, recycling programs are cost intensive and every phase of recycling comes with a significant cost which can overwhelm the producers of beverage containers if the costs are not adequately catered for in the recycling plan (Da-Cruz et al, 2014; Hanisch, 2000).

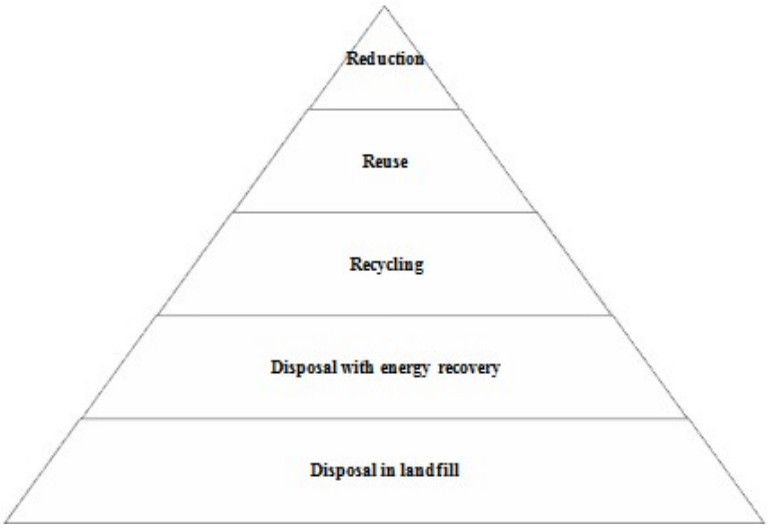

Figure 7 Reverse logistics hierarchy (Carter and Ellram, 1998)

2.8 Drivers of Reverse Logistics

The three drivers of reverse logistics, namely, legislation, economic and corporate citizenship are connected to one another and the boundaries between each may be blurry (Alvarez-Gil et al., 2007). Dowlatshahi (2000) opined that reverse logistics focuses on environmental and economic goals and the realization of one does not impede the realization of the other.

Organizations practice reverse logistics for many reasons and some of them are, profit potentials, regulatory pressure, social pressure and customers/ stakeholders' pressure. However, from the many adoption examples, (Thienen et al., 2014; Abdullah et al., 2014) opined that regulatory pressure or legislation is the main driver of reverse logistics.

2.8.1 Legislation

Government legislations and policies have prompted many organizations to have a rethink of their supply chain strategy and the way they do business. The extent in which regulations have influenced reverse logistics decision in many organizations cannot be overemphasized. As a matter of fact a significant number of organizations engage in sustainable practices like reverse logistics because of the fear of not violating environmental or packaging legislation regulations (Abdullah et al., 2014; Carter and Ellram, 1998; Dowlatshahi, 2000). In some product categories, consumers are obliged to legally or voluntarily return used products to producers after their useful end of life.

A significant number of these environmental regulations are based on the concept of extended producer responsibility and it charges producers of commodities with the responsibility of taking back the post-consumer products or the residues of products they place into the market. Besides the taking back of post-consumer products or used beverage containers, government legislations also set implementation guidelines such as the material requirements for packaging, the recovery of used products and the manner at which firms should dispose of hazardous materials. Handfield et al., (2005) emphasizes the importance of government participation through legislations and consumers participation in reverse logistics process as the prerequisite for a sustainable supply chain. Some of the environmental regulations that have shaped the approach of doing business are, European Union directives such as, Waste Electrical and Electronic Equipment Directive (WEEE), Packaging and Packaging Waste Directives (PPW), and the Restriction of Use of Certain Hazardous Substances Directive (RoHS).

2.8.2 Economic

The recovery of post-consumer products or materials in reverse logistics affords manufacturers the opportunity to save costs and to reduce the usage of virgin raw materials in their production line. The economic and environmental reasons of practicing reverse logistics go hand in hand with one another, and the practice of one gives organizations the benefit to have other. According to the report of Hyman et al., (2013) “recycling a ton of aluminum saves 1.3 tons of bauxite residues, 15 m^3 of cooling water, 0.86 m^3 of process water and 37 barrels oil”. The statement above is a good reason for businesses to practice reverse logistics. As it does not only reduce the cost of doing business for organizations it also contributes to the environmental well-being.

A significant number of the organizations practicing reverse logistics today do so based on economic reasons and according to Dowlatshahi (2000) “producers that remanufacture saves an estimate of about 40% to 60% of the cost of manufacturing a new product and with 20% less effort”. Aluminum cans, PET and glass bottles are examples of sustainable resources that can be recycled repeatedly to manufacture new containers or to be used in other supply chain.

In addition, the reutilization of post-consumer products helps to decrease the volume of waste that might either end up on landfills or littered the streets and also saves the state and organizations the cost of waste management.

Further, aside from the opportunity to recovery spare parts from used products, organizations can increase their revenue by reselling refurbished or remanufactured post-consumers products to improve their profitability.

2.8.3 Corporate Citizenship

Corporate citizenship is defined as organizations search for sustainable development from an environmental and social point of view (Alvarez-Gil et al., 2007) without jeopardizing firms' opportunity to make profit. These days organizations are not only assessed based on their productivity or profitability, as many consumers in the developed world are now concerned about organizations environmental performance.

The pursuits of corporate citizenship afford organizations the possibilities of achieving the economic benefit of reverse logistics as the drivers of RL are somehow connected to each other. (Alvarez-Gil et al., 2007) Moreover, an environmental friendly organization that has its products in recyclable or reusable containers is not only contributing to waste reduction in the community by reusing disposed containers to manufacture new ones. The organization is also creating jobs for the local recyclers and an opportunity for the poor in the community to make money by picking and selling disposed containers. (Hyman et al., 2013)

Furthermore, many organizations in developed countries have come to the realization that their commitment to sustainable development is a competitive tool that has the potential to positively improve the image of the company (Abdullah et al., 2014).

2.9 Consumers Involvement

It is wasteful to discard waste or materials that can still be reused or recovered to manufacture new product to the nature. A significant number of waste legislations and directives around the globe require consumers to voluntarily or legally return products after their useful end of life for value recovery and reuse (Breen, 2006). Besides legislations consumers' participation in reverse logistics or recycling programs depends on individual consumer and the values they hold on the environment.

There are circumstances where consumers exert pressure on producers to take back the post-consumer materials of their products and this was done out of their genuine concern for the environment. (Gonzalez-Torre and Adenso-Diaz, 2006). Consumers' involvement is important for the successful implementation of reserve logistics and every recycling program relies on consumers for the supply of its inputs. (Ravi and Shankar, 2015)

Cheng and Chiou-nan (2013) identified the reasons why consumers partake in reverse logistics programs as the extrinsic incentives and the intrinsic motives. The extrinsic incentives is when the consumers are financially motivated to return post-consumer products for reuse or for recycle (Yeh and Vaughn, 2008) and the level of products return is usually proportionate to the amount of refunds or the value of incentive on post-consumer product. The extrinsic incentives could be in the form of monetary value, tickets, and coupons or lotteries. While the intrinsic motive is done out of environmental concerns and consumers return post-consumer product because they feel it is the right thing to do and it contributes to sustainable development.

In a society where consumers display positive attitude toward the recycling of post-consumer products, such society will enjoy a sustainable and viable recycling industry that is fueled with the regular supply of beverage empties from households. On the other hand in a society where consumers do not have regard for waste management guidelines, it is the people and the environment that suffers the consequences of poor waste management. (Anderson and Brodin,2005)

3 Research Methodology

This section of the study provides an overview of the research methods, the description of cases and the data collection methods. In addition, comparison of the waste management system in Helsinki and Lagos will be compared and the present status of beverage container supply chains will be analyzed in this chapter. Firstly, a description of the case studies is presented followed by the details of the survey.

3.1 The description of the Case Studies

The two case studies were selected to reflect the realities of two different worlds; one of them represents the advanced societies where best practices of waste management are designed in the system. While the other represents the developing nations of this world that have not yet come to the realization that waste are resources that can be reused as secondary materials.

3.1.1 The city of Lagos

Lagos is one of the most populous cities in the world with a population 11.1 million people in 2005 and was projected to reach an estimate of 17 m by the year 2015 (Morka, 2007). It is the smallest state in Nigeria in terms of geographical size, it is approximately 3577km^2 and lies between latitudes 6^0 52 and longitudes 3^0 37 (Soladoye and Ajibade, 2014).

Lagos state was the former administrative capital of Nigeria until 1990 when the capital was changed to Abuja. However, the relocation of the capital to Abuja did not change the status of Lagos as the commercial centre and the centre for economic growth in Nigeria. The city of Lagos takes pride in its ability to accommodate over 2000 manufacturing industries and over 200 financial institutions despite being the smallest state in Nigeria with about 22% of its size as water bodies (Lagosstate, 2016; Soladoye and Ajibade, 2014).

Despite the size of Lagos, the population of people and waste generation continue to grow in an unsustainable rate and Lagos State Waste Management Authority (LAWMA) do not have a pool of unlimited resources to keep up with the collection and disposal of waste at this unsustainable rate. According to LAWMA, a total of 9,000 metric tons of waste are generated in Lagos on daily basis.

3.1.2 Helsinki

Helsinki is the largest city in Finland and also doubles as the administrative capital of Finland and the centre of the Helsinki metropolitan area. Helsinki metropolitan area comprises of

Helsinki, Espoo, Kauniainen and Vantaa with total inhabitants of 1,122,101 and occupies a land space of 745km^2. Helsinki metropolitan area is Finland's economic power house, home to more than 10 higher institutions of learning and a key tourist's hub in Finland. Helsinki metropolitan area in 2015 generate 312.8 tons of waste daily, which is an improvement of the previous year in which 517 tons was generated (BALTICICA, 2016; HEL, 2016).

3.2 Methods and Data collection

A comparative study is considered appropriate for this study because of the nature of the phenomenon of this thesis which has to be studied from different point of view. A comparison of the practices in Lagos with the best practices that is obtainable in Helsinki and Finland will also be analyzed using the elements of waste management prescribed by Diaz et al., (2005). According to Hancock and Algozzine (2006) the insights and knowledge gained from case study analysis can directly influence or be used as a tool for policy making and in designing procedures.

3.2.1 Primary Data

A questionnaire survey was the main source of primary data used in gaining insight into the waste management situation in Lagos. A total of 150 questionnaires were administered in the city of Lagos, precisely in Lagos mainland division of the state and 94 of them were returned fully answered while 13 others were returned incomplete and the remaining 43 were never returned by respondents. The questionnaires were randomly distributed to households and students in two of the higher institutions of learning in Lagos state. The institutions are Lagos state polytechnic which is located in Oshodi/Isolo local government and Yaba College of technology in Lagos mainland.

In total 50 questionnaires were distributed in the two institutions and 41 of them were returned. The remaining 100 questionnaires were administered on households with 53 of them returned and completely answered. A higher return rate was recorded in the batch distributed in the institutions of learning than the ones distributed to households and the reason was because the questionnaires were personally handed to respondents in the institutions to answer and were personally collected in the same day.

The questionnaire was designed using a 5 item Likert scale which according to (Croasmun and Ostrom, 2011) is used for measuring self efficacy and for assessment of attitudes. The questionnaire provides the respondents a scale which ranges from strongly agree to strongly

disagree and the middle point titled undecided. The questions of the survey are closed ended and were developed using insights gained from past literatures on waste management, reverse logistics and recycling in developing nations.

3.2.2 Secondary Data

A couple of secondary data were employed in this study to shed light on the phenomenon that is being studied and to analyze the problem of this study from different backgrounds. The chapter two of this study is a composition of different sources of secondary data and they are all open data. Some of which are academic journals, articles, data from companies websites, government publications and regulations, and EU directives on packaging and packaging waste. Another important source of secondary data that is used in this research is a video documentary compiled by a television channel in Nigeria. The video documentary complements the other sources of data to answers the research questions.

The video documentary is titled converting waste to wealth and is centered on the practices and management of municipal solid waste in Nigeria. Though this study is about used beverage containers but this documentary is still relevant in studying this topic because it focuses on the recovery of recyclable waste and beverage containers were specifically mentioned in most instances. Despite the fact that the documentary does not specifically focus on used beverage containers, it is still relevant for this study because a significant number of households and consumers of beverage drinks in Nigeria handle used beverage containers the same way they discard the non-recyclable waste. The documentary is a compilation of interviews of different stakeholders of waste management in both Lagos and the national level.

3.3 Comparison of Lagos and Helsinki waste management approach

The evaluation method employed for the comparison of the two systems is drawn from the elements of comprehensive solid waste management system outlined by Diaz et al., (2005). Rather than using all twelve elements outlined, seven were selected for the comparison. The two cities are compared with each other using the seven selected elements of waste management in order to identify the practices, processes or even policies that can be learnt

from the Finnish system and to develop a framework that is implementable in the city of Lagos.

The setting of policies is one of the elements of solid waste management outlined by Diaz et al., (2005). In the Finnish society, the national laws on packaging and packaging waste (Government decision on packaging and packaging waste 962/1997) are transposed of EU directives on packaging and packing waste (directives 94/62/EC and 2004/12/EC) and as a member of EU, Finland must comply with the provisions of each directive and the deadline of achieving set goals.(Da-Cruz et al., 2012; PALPA, 2016) The ministry of environment plays an important role in matters of waste management both in national, EU and international level. The ministry participates in the drafting of the EU directives; they prepare the national laws and also put mechanism in place for the implementation and monitoring of the waste policies. (YM, 2015) Finland's national waste plan for 2016 which was approved back in April 2016 emphasizes on a recycling society and a set target of 50% waste recycling, 30% recovered for energy and not more than 20% landfilled by the year 2016. (Sahimaa et al., 2015)

Whereas in Nigeria, there is no regional co-operation on waste management among West Africa countries and every country unilaterally makes its policies. The federal ministry of environment prepares the national environmental policies and the National environmental Standards and Regulations Enforcement Agency (NESREA) which is an arm of the ministry of environment is responsible for the monitoring and enforcement of environmental laws. The environmental policies enacted at the federal level supersede all laws made at the state level. In Lagos state, LAWMA is in charge of waste management while Lagos State Environmental Protection Agency (LASEPA) is the environmental regulator. There is no national waste strategy in Nigeria (Documentary, 2016) and most environmental regulations do not aim at the 3R (reduce, reuse and recycle) of waste management (Abila and Kantola, 2013; Kofoworola, 2007).

Waste characterization is another important element of solid waste management that is used as a tool of planning waste management. The waste characterization and generation in Finland are captured and reported from time to time and this information is available for the public. The Helsinki metropolitan area in the year 2015 generated a volume of 312,800 tons of waste and an average of 0.3 tons per head. A total of 37% of waste are biodegradable, plastic 16%, fiber/papers 17% while metal and glass account for 3% and 2% respectively (HSY, 2016; HEL, 2016)

Data on waste generation in Lagos and Nigeria as a whole is either poorly captured by the authority or not captured at all. According to (Oresanya, 2016) the former managing director of LAWMA charged the federal ministry of environment on need of providing accurate data on waste across states which can enhance waste planning and management. Some scholars also gave estimates of waste generated in their studies such as, Aliu et al., (2014) who estimated that Lagos generates between 3.1 million and 4 million metric tons of solid waste yearly. While LAWMA (2016) stated Lagos generates 9,000 metric tons of waste daily at the average of 0.5 kg per individual. Ogwueleka (2009) stress further that biodegradable waste accounts for 60% of total waste generated in Nigeria and only 8% of waste are recovered for reuse.

Another element of solid waste management that is considered for this comparison is the physical handling of waste and recoverable materials. In Finland households and individuals separate used beverage containers from other waste with the aim of returning them to collection centers' or to reverse vending machines to claim the deposits on each beverage container. (PALPA, 2016) Whereas in Nigeria, a significant number of the population dispose of used beverage containers with other unsorted municipal solid waste (Afun, 2009). Recovery activities are usually done by agents of the informal sector who sort waste from different waste disposal sites (Kofoworola, 2007; Abila, 2014) and some private organizations who buy the recovered items from the waste pickers (Ogwueleka, 2009).

In addition, public information and education are important aspect of the comprehensive solid waste management system. The situation in Finland and Helsinki are the same, the operator of the deposit return system (PALPA) continually educate residents on the best practice of discarding used beverage containers. Kids are not left out in the awareness program because they are taught about waste separation both at home and in school from childhood. More so there are mobile applications, where people living in Finland can access waste management guide and instructions (HSY, 2016; PALPA, 2016).

The level of public awareness and education on sustainable waste management is low (Abila and Kantola, 2013; Ezeah and Roberts, 2012). Imam et al., (2008) also emphasizes that public awareness and attitude to waste can hinder every phase of solid waste management, therefore continuous public awareness program is necessary for the effective management of municipal solid waste.

Furthermore, the management of public sector administrative and operation units will also be used as basis of comparison of the two cities. The operator of the Finnish deposit system, PALPA, is a nonprofit organization that outsources virtually all its operations to stakeholders that are involved in the collection, recycling and reusing of used beverage containers. More so, the cooperation that exist between PALPA and stakeholders like the municipal authorities, the ministry of environment, the Finnish custom, retail outlets and consumers makes the reverse logistics of beverage containers achievable (PALPA, 2016).

In Lagos, the function of waste collection has been outsourced to private organizations through the PSP program but there is no cooperation between either the packaging industry or producers of beverage drinks and any of the governmental agencies or even the government be it at state or federal level in developing a sustainable means of management the post-consumer products (LAWMA, 2016; Oko and Anayo 2013).

Additionally, the marketing of recovered products to brokers or end users is one of the factors that distinguish the Finnish operator of the deposit system, PALPA and the Lagos state waste management authority. Recovered beverage containers in Finland are sold to the reprocessor, who give used beverage containers a new life and the proceeds from this exchange are used to cover the cost of recovery and the logistics of used beverage containers (PALPA, 2015). Unfortunately, the Nigerian economy is not as organized as her Finnish counterpart and the marketing of recovered beverage containers depends on the actors or organizations involved. The recovery of used beverage containers is mostly done by waste pickers or scavengers and they market recovered items directly to the recyclers or to intermediaries who sells to recyclers. Other actors are LAWMA and private businesses that recovers recyclable items from waste and market them to the packaging industry or the recyclers.

Establishing prices for services and incentives for recovery of used beverage containers are issues that need to be addressed in the city of Lagos and Nigeria. There is no value ascribed or attached to empty beverage containers in Nigeria neither are there other incentives available for practicing recycling in Nigeria aside from the waster pickers or scavengers that make living from used beverage containers. Unlike Nigeria, the Finnish operator of deposit system, PALPA has a uniform price in form deposit for different category of beverage containers. The value of the deposit are inscribe on every container's body to serve as incentives for consumers to return the empties after consumption. The cost of recovering beverage empties are bore from the payment and subscription of manufacturers and brewers to PALPA

4 Empirical Evidence

This section of the study presents the empirical findings of the survey conducted on consumers of soft and alcoholic beverage drinks in the city of Lagos. The collation and analysis of data was done with IBM SPSS software and descriptive statistics was employed to structure and analyze the data of the questionnaires.

4.1 Demographic Composition

The sample population of this survey was 150 respondents and from the sample size, an impressive response rate of 62.7% which amount to 94 respondents was gathered for data analysis. The frequency table and cross tabulation method were employed to further analyze and interpret the demographic data of the sample size. From the 94 valid respondents, 51.1% were male while the remaining 48.9% were female. The margin between male and female respondents was so close and it can be said that the two genders were well represented in the survey as depicted in table 5.

Table 5 Sex

	Frequency	Percent	Valid Percent	Cumulative Percent
Male	48	51,1	51,1	51,1
Female	46	48,9	48,9	100
Total	94	100	100,0	

The age of the respondents was categorized into five groups, namely, the below 15 years of age, the 15-24 age range, the 25-34 age range, the 35-54 age range and the 55 and above years of age. From the total sample of 94 respondents the 15-24 age range account for the highest number of participants with 47.9% and was followed by the 25-34 age range with 38.3% . The 35-54 age group constitute 9.6% of the sample population while the below 15 age group had the smallest representation in the survey with 4.6% and the 55 above age group had no participant as shown in table 6 below.

Table 6 Age of respondents

	Frequency	Percent	Valid Percent	Cumulative Percent
Below 15	4	4,3	4,3	4,3
15-24	45	47,9	47,9	52,1
25-34	36	38,3	38,3	90,4
35-54	9	9,6	9,6	100
Total	94	100	100	

The level of education of respondents was also considered for the purpose of analyzing the data of the survey. It is important to note that from the four education groups listed for this survey, namely West Africa Entrance Examination Council (WAEC) which is equivalent to high school education in Europe and other parts of the world. The polytechnic lower National Diploma and the National Certificate Examination, university degree holders and the postgraduate education. From the above classified groups only two groups, namely NCE/ND and HND/BSC were represented in the survey with 39.4% and 60.6% respectively as depicted in table 7.

Table 7 Level of education

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	NCE/ND	37	39,4	39,4	39,4
	HND/BSC	57	60,6	60,6	100,0
	Total	94	100,0	100,0	

The occupation as shown in table 8 and 9**,** has 48.9% of the respondents as students, 23.4% are self employed, civil servants constitute 18.1% of respondents while professionals have the lowest representation with 9.6%.

Table 8 Occupation

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Self employed	22	23,4	23,4	23,4
	Civil servant	17	18,1	18,1	41,5
	Professional	9	9,6	9,6	51,1
	Other	46	48,9	48,9	100,0
	Total	94	100,0	100,0	

Table 9 Other_ occupation

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid		48	51,1	51,1	51,1
	Student	46	48,9	48,9	100,0
	Total	94	100,0	100,0	

4.2 Data Analysis

A 5 point Likert scale which ranges from "Strongly Disagree" to "Strongly Agree" and "Indifferent" in the middle. The scale was applied across most questions of the survey in order to capture the opinions, attitudes and feelings of respondents to different questions for easy analysis and reporting of data. In addition, this analysis section also employs charts, graphs and frequencies table to interpret the data generated from the survey.

The "indifferent" option of the table was interpreted as neither agrees nor disagrees and it was interpreted as such in the data analysis. The other four choices, namely strongly agree and agree are interpreted as agreed while disagree and strongly disagree are interpreted as disagreed for the purpose of analyzing the outcome of the survey.

The table 10 below depicts respondents' opinions across a group of related questions that tests if respondents' actual practice effective waste management in the city of Lagos. The implication of this is that majority of respondents, about three quarter of the sample population understands the importance of proper waste management and yet less than half of

the respondents actually practiced waste separation from the source which is one of the fundamental elements of sustainable waste management. In addition, there is almost an equal split of respondents' opinion on the current state of waste management in Lagos and what baffles one is the fact that a quarter of respondents had no opinion on the current state of waste management in Lagos. Despite the fact that municipal waste management is an important topic that affects the wellbeing of the people and the society at large.

Table 10 Knowledge of sustainable waste management

Please indicate your level of agreement with the following statements.	Percentage * No of respondents				
	Strongly disagree	Disagree	Indifferent	Agree	Strongly agree
I am satisfied with the state of waste management in the city of Lagos.	14.9%	21.3%	24.5%	33.0%	6.4%
Proper disposal of waste will improve the current state of waste management in Lagos.	10.6%	3.2%	8.5%	47.9%	29.8%
My household waste is separated into recyclable and biodegradable before the final disposal.	26.6%	17.0%	19.1%	30.9%	6.4%
It is appropriate to dump household waste on dumpsite, road side or in drainage.	58.5%	14.9%	7.4%	12.8%	6.4%

In table 11 three set of questions were tested to determine if respondents actually understand that as individuals and households they also have a role to play in the management of waste in their respective communities. Interestingly majority of the respondents (77.7%) agrees that waste management is everybody's responsibility. This response reflects the position of Imam et al., (2008) which states that environmental quality is a function of collective responsibility which does not exclude individuals. However in another instance more than half of the respondents still think that waste management is the exclusive duty of government. This response shows that the level of awareness of the populace on sustainable waste management practice is still low. Further, Gonzalez-Torre and Adenso-Diaz, (2006) lay emphasis on the importance of communication with the consumers because they are the first link of the reverse supply chain. The communication could be from the government, packaging industry or the producers of beverage drinks to enlighten the consumers on the goals and waste management guidelines. However the absence of effective communication mechanism will jeopardize the waste management plan.

Table 11 Taking ownership of waste management

Please indicate your level of agreement with the following statements.	Percentage * No of respondents				
	Strongly disagree	Disagree	Indifferent	Agree	Strongly agree
Waste management is everybody's responsibility.	7.4%	7.4%	7.4%	33.0%	44.7%
Waste management is the sole responsibility of governments at all level.	9.6%	20.2%	11.7%	30.9%	27.7%
Waste management is the sole responsibility of producers.	8.5%	30.9%	13.8%	33.0%	13.8%

Table 12 illustrates the level of awareness of the respondents on sustainable waste management practice. A half of the respondents agree that they are aware of government directives on waste management and particularly the ones on used beverage containers. In reality, majority of the populace in Lagos handle empties of beverages as any other waste and government policies are not focused on the 3R of sustainable waste management (Kofoworola, 2007; Osinbanjo, 2016). Besides, the private sector actively promotes the culture of material reuse and recycling through the recovery of beverage empties. Additionally, a total of 53.2% of respondents think otherwise on the practice of extended producer responsibility by beverage drinks producers and packaging industry. These responses are corroborated by the position of Abila and Kantola (2013); Oko and Anayo (2013) which states that the commitment of packaging and product producers in reverse logistics and the reuse of discarded aluminum cans and PET bottles are really low and the level of awareness of Nigerians on sustainable waste management is poor. Though producers of beverage containers have an ongoing campaign that promotes recycling of containers inscribed on both aluminum cans and PET bottle despite that do not have reverse logistics program to collect used beverage containers (Oko and Anayo, 2013).

Table 12 Awareness of measures to discourage inappropriate disposal of beverage empties

Please indicate your level of agreement with the following statements.	Percentage * No of respondents				
	Strongly disagree	Disagree	Indifferent	Agree	Strongly agree
I am aware of government directives on waste management particularly the ones on empty beverage containers.	12.8%	20.2%	17.0%	35.1%	14.9%
Producers, particularly beverage drinks and packaging producers are making efforts to encourage consumers to return used beverage containers.	25.5%	27.7%	24.5%	10.6%	11.7%

One of the important issues that were tested in the survey is the manner in which the respondents discard empties of beverage drinks after consumption. The question was put across to respondents in two different ways as shown in both figure 8 and 9 below. In figure 8 respondents were asked to indicate the method they use in disposing empties of beverage drinks consumed while on the road or in the traffic. Interestingly, 53% of respondents look around for available waste bin to discard used containers. While 37% of respondents inappropriately discard used beverage containers manner and the remaining 10% keep a collection of empty containers possibly for reuse or recycling.

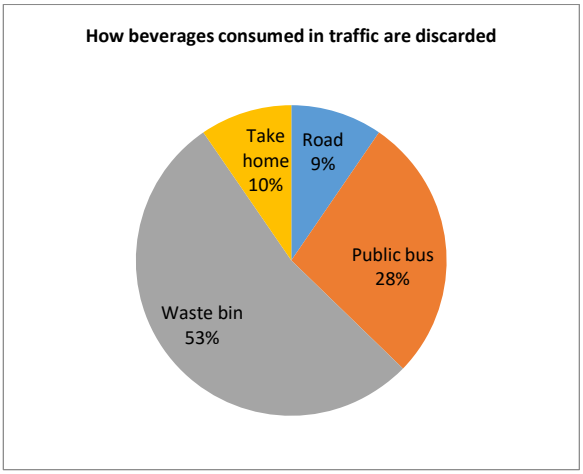

Figure 8 How beverages consumed in traffic are discarded

The survey as shown in figure 9 also seeks to know if the respondents actually practice sustainable disposal in their respective household and the overall response was not surprising. A total of 62% of respondents patronize state licensed PSP operators, 10% of respondents dispose used beverage containers indiscriminately, while 21% patronize agents of informal sector. The remaining 7% of respondents do return used beverage containers to waste buyers who act as intermediary between households and recyclers.

In both figures 7 and 8, in as much as the end consumers do not discard used beverage containers indiscriminately, there is still likelihood that a significant amount of the empties will be recovered by waste pickers, house to house waste buyers or through the LAWMA buyback program. In the case of the containers that were not disposed of appropriately, there are little chances of their recovery and reintegration to the system. According to the author's observations in appendix d, the containers that were discarded in public space are still where they were dumped constituting waste of resources and a nuisance to the environment.

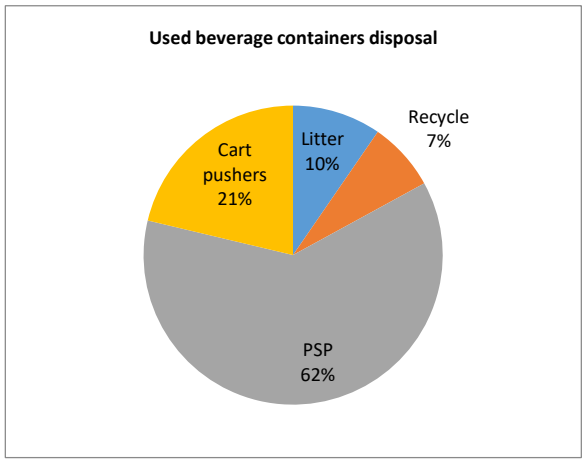

Figure 9 Used beverage containers disposal

Furthermore, respondents were asked to rate their performance on household waste management in figure 10. The results was not too surprising considering the position of Oko and Anayo, (2013); appendix d, on how beverage empties have defaced the streets of Lagos and other cities in Nigeria. A total of 12% of respondents rated themselves as very high, 47% high, 23% were indifferent while the remaining 14% rated themselves low.

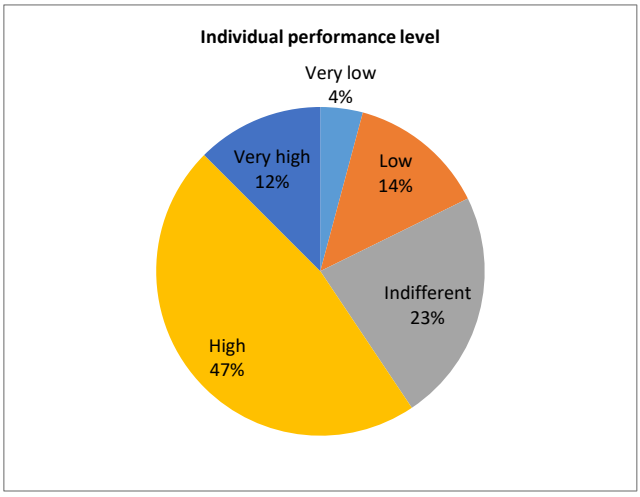

Figure 10 Individualperformance level

A cross tabulation technique was employed to analyze the relationship between the different age range and the frequency of consumption of beverage drinks in aluminum cans and PET bottles. As illustrated in figure 11, a total number of 41 (43.6%) out of the 94 respondents consume drinks in beverage containers at least once every day and the age group 15 - 24 constitutes 44% (18) of the group. Likewise, age group 15- 24 which accounts for 54% (21) of the 39 respondents that consumes a bottle or can of drink at least once weekly. In the two instances the age group 25 – 34 was the second highest consumers of beverages drinks with 15 and 16 respondents respectively. A total of 12 (12.7%) respondents indicated that they do take beverages packaged in aluminum cans or PET bottles at least once a month while just 2 (2.1%) respondents do not take beverage drinks in PET and cans. The significance of this chart is to illustrate that there is a huge market for packaged beverage drinks in the city of Lagos and that their residues can be put into productive use.

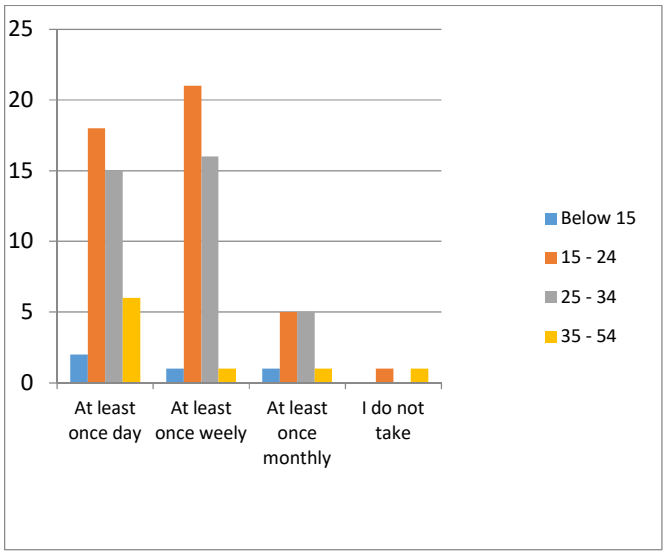

Figure 11 Cross tabulation of age and frequency of consumption

The statements in table 13 consider the role and attitude of consumers toward the reverse logistics of beverage containers. The first statement shows that only 28.8% of the respondents are aware of the collection points where beverage empties can be returned in Lagos. This response clearly shows the inefficiencies of the waste management authority in addressing the indiscriminate disposal of used beverage containers in the city of Lagos. The low awareness of the populace is quite surprising considering the waste management reforms that were implemented by Lagos state government and the establishment of recycling facilities, the buyback program and the recycling banks in eight strategic locations within the state

(Ezeah and Roberts, 2014). Government needs to do more to sensitize the people about the availability of these facilities. Moreover, the successful implementation of waste policies including recycling programs depends on the identification of collection point (Kofoworala, 2007) and the continuous publicity to educate households and consumers on waste management guidelines (Martin et al., 2006; Ezeah and Roberts, 2012).

Cheng and Chiou-nan (2013) state that average human being is either extrinsically or intrinsically motivated to recycle empties of beverage container. The survey reveals that less than half of the respondents are either intrinsically or extrinsically motivated to keep and return the empties of beverage containers to the producers, the recyclers or whoever the case may be. While more than a third of respondents are not motivated at all to return empties of beverages they consume. The concern of these set of questions is that as much as 27.7% of respondents are undecided on whether to participate in recycling or not. It is understandable that some people will still not participate in the recycling process of beverage containers even with good incentives in place. However the number of undecided respondents is a wakeup call for the appropriate authority. It is not enough for government to establish recycling villages or banks without involving the consumers in the process. The consumers are the first link of the reverse supply chain, therefore constant communication and continuous education of consumers on what is expected of them is paramount to the success of the reverse supply chain of beverage containers.

Moreover, more than half of the respondents (55.3%) agree that the extension of the reverse logistics of refillable glass bottles to other beverage containers, such as PET bottles and aluminum cans, will ensure smooth return of empties. A total of 29.8% thinks otherwise while about 15% of respondents do not have opinions on the statement.

Table 13 Handling of used beverage containers in eco-friendly manner

Please indicate your level of agreement with the following statements.	Percentage * No of respondents				
	Strongly disagree	Disagree	Indifferent	Agree	Strongly agree
I am aware of the designated centres and agencies where one can return empty beverage containers.	31.9%	23.4%	16.0%	16.0%	12.8%
I am motivated to collect and return my used beverage containers to the producers or recyclers.	16.0%	18.1%	27.7%	28.7%	9.6%
I would return empty plastic bottles and aluminum cans for a token of 10% of the price of the drink.	13.8%	22.3%	21.3%	29.8%	12.8%
The extension of the circular economy system of glass bottles to plastic and aluminum cans will facilitate smooth return of containers to producers.	11.7%	18.1%	14.9%	34.0%	21.3%

The survey also inquired from respondents the most preferable place they would like to return their used beverage containers. Five different options, namely, retailers, local supermarket, distributors, recycling and local government offices were presented before the respondents and the outcome is as follows. As shown in figure 12, recycling centre returns accounted for 30% of respondents' choice and is closely followed by a return to the nearest local government secretariat with 28%. Retail stores accounts for 17% while supermarket (groceries stores) was 16% and distributors return was the least favored option with 9% of respondents.

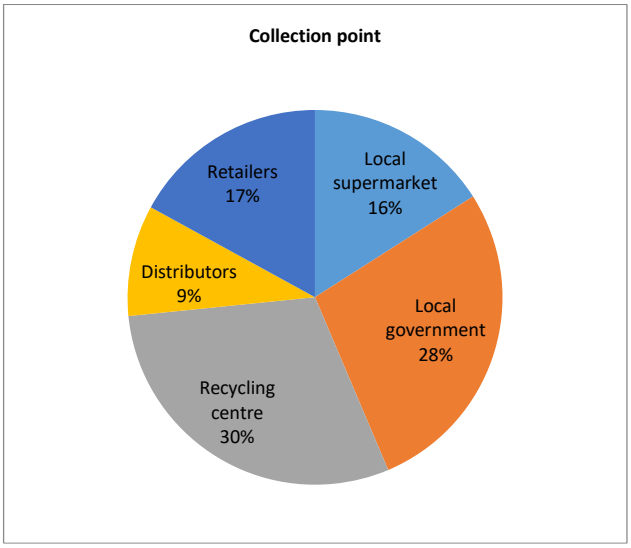

Figure 12 Collection point

5 Discussion

This section of the study recaps the data analysis section and also reflects on the framework of the study in answering some of the research questions raised in the first chapter.

5.1 Result Discussion

The reverse supply chain begins from the consumers and ends with the producers or recyclers that reprocess and reuse empties of beverage drinks (Gonzalez-Torre et al., 2004). The success of reverse logistics or recycling in any society greatly depends on the attitude of the end users whom also double as suppliers of secondary raw materials, to separate recyclable residues from household waste (Gonzalez-Torre and Adenso-Diaz, 2002).

In the case of Lagos state, as shown in table 10, an overwhelming 77.7% of respondents agreed that proper waste management will improve waste management in the city of Lagos and yet only 37.3% of respondents actually practice waste separation. Waste separation from the source is the responsibility of households and individuals, and is an essential element of municipal solid waste management. The absence of it makes the management of municipal solid waste more cumbersome and expensive to recover recyclable materials. The pictures in appendix D depict some of the environmental problems of a society that lacks waste separation policy.

It is also important to note that recycling in developing countries is usually done by agents of the informal sector (Stutz, 2008) and Lagos is not an exception. Though there are some entrepreneurs in the city of Lagos who incentivize households to separate and keep a collection of used beverage containers which they buy and later resell to manufacturers and recyclers (Miller, 2014). In contrast to developed countries like Finland, the law stipulates that producers of beverage containers and other producers are responsible for the post-consumer phase of their products. Consequently, this directive has led to the establishment of a deposit return system, PALPA, by a consortium of beverage drink producers and retail businesses that acts on their behalf in fulfilling the obligations imposed on them by law.

Furthermore, the survey conducted in Lagos shows that drinks in beverage containers have so far received high patronage from Nigerians especially residents of Lagos and a high number of empties are being generated on daily and weekly basis. A significant number of the beverage empties are discarded inappropriately, as illustrated in figure 11 and 8, and table 10 of this study. In contrast, Helsinki and Finland are not challenged with the issues of

indiscriminate disposal of used beverage containers and consumers are adequately incentivized to return used containers through the mandatory deposits on containers. According to PALPA (2016) Finland is second to none in the recycling of used beverage containers in the world and an estimate of two billion beverage containers is recycled yearly.

Abila and Kantola (2013) states that inappropriate disposal of waste is a common phenomenon in most urban cities of Nigeria. The result of the survey has clearly shown that before consumers in the city of Lagos can fully assume their new role in the reverse supply chain of beverage containers, government and other stakeholders do have a role to play in inducing the consumers to practice sustainable waste management. Consumers' role in a circular economy is very important; they are the suppliers of secondary materials that substitute the usage of virgin raw materials in the production of new products. The willingness of consumers to return used beverage containers and their participation in the backward flow of used products is crucial to the implementation of reverse logistics programs.

In many developed nations consumers of beverage drinks have gone past the issues of waste separation and indiscriminate disposal. They have moved on to a level whereby they utilize their collective power to exert pressure on producers to show more commitment to the environmental aspect of their business. However, consumers in most developing nations are yet to realize the power they possess to hold producers and even government accountable for the externalities of their operations.

In a nutshell, the role of consumers in the reverse logistics of beverage containers is more of a partnership relationship than a mere end user of the final product of the supply chain. Waste separation from the source is very crucial to the successful implementation of recycling programs and this is a responsibility designated to the consumers who are the links between the traditional forward supply chain and the reverse logistics. Furthermore, the involvement of consumers in the reverse logistics of beverage containers will not only help companies to save cost, it also improves the collection problem of UBC by bridging the gap between consumption/ disposal of UBC and their reintegration as secondary materials into supply chains.

Furthermore, the challenges of managing the post-consumer phase of used beverage containers are not peculiar to Lagos or developing nations alone. Rather it is a phase that many developed countries have gone through and they have been able to develop a

sustainable means of tackling the problems with the combination of right policies and right attitudes. In the preliminary analysis it was established how the city of Oregon in USA, Germany and other European Union countries adopted national policies on sustainable waste management and the principle of extended producer responsibility to reposition their nations to a top performing nation in sustainable waste management. As a matter of fact government policies and legislations have prompted many organizations to practice reverse logistics because they do not want to be caught in the web of compliance issues (Thienen et al., 2014; Abdullah et al., 2014; Dowlatshahi, 2000). According to Sakai et al., (2011) the 3R of sustainable waste management and waste management policies are the basis of developing a material cycle's society.

Government legislations on environmental management do have significant impact on every phase of municipal waste management and when there is no continuity in policies or when legislations are not revisited from time to time to reflect the current needs of the society, then such policies cannot address the needs of a modern society. Osibanjo, (2016) asserts that lack of government policies to compel both producers of commodity to use recycled products and the buyers to patronize recycled product is stalling the waste to wealth campaign in Nigeria. In addition, the absence of environmental policies such as extended producer responsibility and the polluters pay principle in Nigeria has contributed to the neglect of the environment by many producers in Nigeria, especially in the packaging industry and beverage drinks producers who do not feel responsible for the post-consumer phase of their products.

The situation is quite different from Finland's waste management practice, where legislation is a key factor in the management of municipal solid waste. The Finnish national waste plan was drawn from the EU 2008/98/EC and 94/62/EC, which prescribe the 3R i.e. reduction of packaging waste by using recyclable lightweight materials, the using of reusable packaging rather than disposable materials, and the recycling of empty containers rather than their outright disposal. More so, same legislation stipulates stringent conditions for organizations that do not take back the empties of their products such as imposition of environmental tax and excise duties for uncollected containers.

Therefore, the role of legislations in the management of municipal waste cannot be overemphasized, and just as legislation can be used as catalyst for the adoption of reverse logistics, it can also be used to coordinate or to influence consumers' behavior in a particular pattern that suits the waste management plan. Handfield et al., (2005) asserts that environmental friendly supply chains require the participation of government through the

enactment of regulations that compel both the producers and the consumers to embrace sustainable practices.

In answering the research question on how government policies has affected the reverse logistics decision of soft and alcoholic drink producers in Lagos. Government policies has had little or no impact on organizations' reverse logistics decisions due to the fact that most legislations are not based on the 3R of sustainable waste management and as such cannot address the present day challenges of municipal solid waste management. The personal observation as documented in appendix D and the opinion of Osinbanjo, 2016 in appendix A illustrate the inefficiencies that exist in the system and also speak volume on the ineffectiveness of government policies on beverage drinks producers and the packaging industry.

Finally, government campaigns and organizations' public awareness program in promoting the reverse logistics of beverage containers has been so poor and ineffective considering the evidences available in this study. Tables 12 and 13 clearly show the absence of effective communication in the supply chain of beverage containers in the city of Lagos. Table 13 also depicts that a significant number of respondents are not motivated to participate in the recycling of used beverage containers and in addition to that, just 29% of respondents acknowledged that they are aware of the designated collection points for UBC.

The beverage containers in the Nigerian market also have a recycling campaign inscribed on the containers as their Finnish counterpart does but there is no information available to consumers in Nigeria on where, how and why beverage containers should be returned for recycling. Consumers of beverage drinks are not carried along on the waste management reform that was embarked on by the government of Lagos state in 2011. Some aspect of the reform that affects the supply chain of beverage containers like the establishment of recycling banks, recycling villages and the waste buyback centres are initiatives to promote a recycling society. However, the inability of government to involve the consumers through public awareness programs and the introduction of reasonable incentives for recycling has stalled the progress of reverse logistics in the city of Lagos.

6 Conclusion and Recommendation

This chapter of the study presents the conclusion, limitations of study, the recommendations and a summary of the work. It also confirms whether the research questions and the objectives to the study have been answered.

6.1 Conclusion

The aim of the study was to investigate the disconnection between the point of consumption/disposal of beverage containers and the point where they are recovered, reused and reintegrated into supply chains in the city of Lagos. In order to address this problem a theoretical framework was developed based on the best practices of top performing nations in recycling of beverage containers. Importantly, four research questions were also formulated to critically look at the phenomenon of the study.

Research question 1 has been properly addressed in the second chapter of this study using selected articles and academic journals. Reverse logistics in the context of this study means the recycling or reusing of used beverage containers in a closed or open loop supply chain. The implication of this definition is that even the activities of agents of the informal sector that are popularly known as scavengers or waste pickers and waste buyers that liaise between the consumers and recyclers can be considered as reverse logistics. The diagram depicting the supply chain of beverage containers in figure 3, illustrates how the activities of agents of the informal sector and waste buyers amount to reverse logistics.

The second research question also has been dealt with in chapters 2 and 5 using evidences drawn from selected academic journals, waste management policies and data from the survey. In a circular economy the consumers are integral part of the supply chain, they are the first link and the material supplier of the reverse supply chain. Thus, the involvement of consumers in the reverse logistics of beverage containers particularly through separation of households waste is very crucial to it success.

In the third research question it was established that there is correlation between legislation and the adoption of reverse logistics in the context of used beverage containers. Chapters 2, 3 and 5 present an elaborate analysis of the connection between the two. There is no doubt that environmental legislations such as the extended producer responsibility, EU directives 94/62/EC and German packaging ordinance have revolutionized the packaging industry through the introduction of measures that compel producers to recovery, reuse and cycle

materials. However, in the case of Lagos and Nigeria, most environmental policies in Nigeria are obsolete and are not revisited from time to time to tackle the present day challenges of waste management. And as such government legislations has had little or no impact on the reverse logistics decision of beverages and packaging industries in Lagos, Nigeria.

The forth research question has also been addressed in chapters 3, 4 and 5 using evidences gathered from the survey, personal observation and selected journals. There is no evidence that either government campaigns or beverage producers' public awareness program on sustainable waste management has promoted reverse logistics of beverage containers in the Nigerian Market.

The reverse logistics of beverage containers is still practiced on a very small scale in the city of Lagos. Packaging materials are being wasted on daily basis due to the indifferent attitudes of the packaging industry and beverage drink producers to the post-consumer phase of their products. Unlike Finland and some other developed nations where the circular economy of beverage containers is the norm and consumers are seen as integral part of the supply chain. The Nigerian society still perceived the consumers as mere end users of beverage products and even government intervention in the supply chains of producers particularly the packaging industry is almost a non-existence.

Nevertheless, irrespective of the methods adopted by consumers in discarding used beverage containers, there are chances that some of these containers would be recovered and reintegrated into other supply chains by agents of the informal sector and private organizations who also perform recycling activities.

6.2 Limitations

In the course of this study there were some constraints that actually limited the depth of this work. One of the limitations is the sample size of the survey conducted in Lagos. The city of Lagos has an inhabitants of about 17 million people spread across the land mass of the state and from the initial sample of 150 picked for the survey, 94 respondents completed and returned their questionnaires. The sample size of this study is only 94 respondents and the outcome of the survey was used to generalize the opinions of 17 million residences of Lagos state.

In addition, only few researches have been done on reverse logistics and the supply chain of beverage containers in Nigeria. Therefore it limits the access to information on the practice of

reverse logistics in Nigeria. Moreover, a significant number of households in Lagos and other states in Nigeria handles recyclable waste such as beverage containers the same manner they discard other households waste like biodegradable waste.

6.3 Recommendation

6.3.1 Further Research

There are only few studies that have been done on reverse logistics and the activities of the agents of informal sector who actually perform recycling activities in Nigeria. Therefore, there is need for a comprehensive study on reverse logistics and the supply chain of beverage containers in developing countries. In addition to that the role of the agents of the informal sector in the reverse logistics of beverage containers would be an interesting topic to research.

6.3.2 Recommendation for Lagos State and the Government of Nigeria

It was mentioned in the introductory chapter of this study, that recommendations will be made on the development of a reverse logistics model for beverage containers and effective waste management system in the city of Lagos and Nigeria as a whole. The recommendations are based on the insights and lessons learned in the course of this study particularly from the Finnish waste management system

The framework adopted for this study is also proposed for the management of waste and the reverse logistics of used beverage containers in Lagos, Nigeria. However, before the framework can be implementable there have to be some reforms in the current waste management systems and the buck of it stops with the regulatory authority that enact waste and environmental laws. As it is now waste legislations in Nigeria are ineffective (Abila and Kantola 2013) and therefore a national strategy on waste management is long overdue to address the current challenges of waste management Nigeria (Oresanya 2016).

Furthermore, a packaging and packaging waste legislation should be enacted to take care of empty beverage containers and water sachets that are littering public places in Lagos. The reverse logistics hierarchy should be the core of the packaging waste legislation. And the first option of handling packaging waste must be the reduction of packaging materials by producers and the substitution of heavy weight and hazardous materials with light weight packaging materials. The encouragement of producers to patronize and to use reusable packaging material should be the second option of minimizing packaging waste. More so,

refillable and returnable beverage containers should be introduced to the Nigerian market and there should be a plan to gradually phase out disposable and non-returnable beverage containers. The third and the last option of minimizing packaging waste is the recycling of used beverage containers both the returnable and non-returnable bottles.

Further, recycling activities in Lagos and other cities in Nigeria are usually performed by agents of the informal sectors and some private investors. While the packaging industry and producers of beverage drinks are less involved in addressing the post-consumer phase of their products. The concept of Extended Producer Responsibility (EPR) should be introduced in Nigeria through legislations that compel the packaging industry, the producer and importers of beverage drinks to be accountable for the post-consumer phase of their products. The enactment of laws is not sufficient to address the issues of used beverage containers in Lagos, a mechanism should also be put in place to monitor and report the quantities of beverage containers produced and the recovery rate of all beverage containers types at a given time.

More so, the collection of recyclable materials from dumpster is solely done by scavengers or waste collectors in Lagos and other Nigerian cities. There is need for the government of Lagos state to as a matter of fact harness the efforts of the informal sector by including them in the waste plan of the state and mechanize their work for greater efficiencies

The implementation of environmental policies is a major problem among developing countries and even the existence of sound environmental policies are not sufficient without the political will to fully implement the policies. The governance structure in both federal and state level that are in charge of monitoring and maintaining environmental wellbeing should be strengthened to effectively carry out their functions. The federal ministry of environment, The National Environmental Standards and Regulation Enforcement Agency (NESREA), Lagos State Environmental Protection Agency (LASEPA) and Lagos State Waste Management Agency (LAWMA) should be empowered to enforce compliance, conduct lifecycle assessment, and to sanction organizations that default on any of the environmental policies. In addition, the government institutions performing these duties should be well funded and the training and retraining of employees should be done on a regular basis.

The most challenging aspect of the supply chain of beverage containers is the collection phase and before any progress can be achieved there must be an organized approach to the retrieval of used containers from consumers. Besides the enforcement of EPR policy on organizations, a mandatory environmental tax that is similar to the Finnish tax on beverage

containers which was highlighted in paragraph 2.2.3.2 of this study should be levied on producers of beverage containers and beverage drinks producers. The tax will be based on the quantities of beverage containers produced and the unit of beverage drinks sold to consumers. The tax will serve as the cost of business externalities on the environment and a producer that ignores its EPR will have to pay more environmental taxes than those that practice it.

The government of Lagos state should make its recycling plan more comprehensive by encouraging producers of beverage containers and beverage drinks to establish a Producer Responsibility Organization (PRO) to act as intermediary between producers of containers and the consumers. The primary purpose of the PRO will be to oversee the collection of empty containers from consumers who have taken a new role of raw material suppliers. The fact that consumers are the first link of the reverse supply chain makes it important for government, the packaging industry and the producers of beverage drinks to keep an open communication with them in order to achieve a good working relationship with them.

In addition, consumers of beverage drinks should also be carried along in the process of curbing resource wastage through public awareness and education program. Hence, waste management guidelines should be taught in schools, through mobile applications and internet, and even in churches and mosques. Also quality time should be devoted on radio and television announcements on what is expected of consumers as regards empties of beverage containers.

There are eight recycling banks in the whole of Lagos state where consumers can return used beverage containers. For a state of about 17 million inhabitants to have only eight recycling banks, is just as good as not having at all. It is recommended that more recycling banks should be set up within the state and more people should be trained and employed to supervise the collection of used beverage containers in the facilities. The basis for expansion should be one recycling bank per 400 people which means additional 42,500 recycling banks should be established in Lagos metropolis. In addition, considering the fact that Nigeria is still lacking in some infrastructures and amenities, a total automation of the collection of used beverage containers such as the use of reverse vending machines is not feasible right now because of the logistics involved. However, a pilot project of automated collection of used beverage containers can be conducted with the initial eight recycling banks to ascertain the gains and benefits of using reverse vending machine before the investment is made.

Furthermore, a modern model of the deposit system similar to the model of glass bottles should be adopted for aluminum cans and PET bottles in Nigeria. The deposit system of glass bottles has been a success in the Nigerian Market and it has also shown that consumers of beverage drinks react positively to financial incentives as explained in section 2.5, which is a positive indication of consumers' acceptance of deposits on aluminum cans and PET bottles.

In addition to that, the federal ministry of environment and their states counterparts together with NESREA and other stakeholders such as the packaging industry, producers and importer of beverage drinks, and consumer right protection agency should decide on the ideal deposit that would be on different types and sizes of packaging materials. Furthermore, they should work out modalities for the collection of beverage containers, how the deposits will be charged and the refunding of deposits. It is also important for government to enact laws that clarifies the role of every stakeholder in the management of the deposit system and there should be sanctions for any stakeholder that does not fulfill its obligations towards the effective management of the deposit system.

There are many benefits attached to the adoption of sustainable supply chain for beverage containers and every stakeholder stands to benefit quite a lot from its implementation. The reverse logistics of beverage containers will curb the indiscriminate disposal of beverage empties and instead channel them to recycling facilities where they are recovered and reintegrated into different supply chains. The metropolis of Lagos will not only be clean and free from waste containers with the practice of reverse logistics. It will also preserve natural resources and keep the city of Lagos and Nigeria on the path of sustainable development.

The government of Lagos state and the municipal authorities will also benefit from the implementation of reverse logistics through the reduction in the cost of managing municipal solid waste. More funds would also be accessible to government to tackle waste collection problems such as free riding containers, through the environmental taxes levied on the producers of beverage containers.

Furthermore, the producers of beverage containers and fillers of beverage drinks also stand to benefit from the implementation of reverse logistics in the area of waste minimization and reduction in the cost of sourcing raw materials. Rather than frequently importing from other nations or extracting virgin raw materials from nature to produce new beverage containers, the waste generated in the post-consumer phase are converted into secondary raw materials and prepared for reuse in the production phase of the supply chain. The adoption of extended

producer responsibility policy in Nigeria's packaging industry will prompt producers to design eco-friendly containers with high reusability and recyclability which will make their work much easy.

Finally, the implementation of the above recommendations would resuscitate the dying recycling industry in Nigeria by continuously keeping them at work through the constant supply of beverage empties by organized PROs of both packaging producers and beverage producers. In addition, more jobs would be created in the recycling industry and waste recovery agencies. And households and individual will be more enlightened and motivated to separate waste from source and to return empty containers to collection centers in return for the deposits on every container they returned.

6.4 Summary

The reverse logistics of beverage containers entails collaborative efforts of all stakeholders and supply chain actors and any society lacking supply chain cooperation will give room for inefficiencies in the system. It is the responsibility of government to develop a road map to sustainable waste management and communicates it vision and direction to all stakeholders. Government also participates in the supply chain of producers by legislating environmental sustainability laws with clearly defined goals such as the implementation of the hierarchy of reverse logistics or the 3R (reduce, reuse and recycle) that was adopted and discussed in the literature review section. Besides the enactment of legislations and compliance enforcement government also educate stakeholders and play supervisory role through different agencies of government.

In Finland and other advanced economies, the packaging industry and producers of beverage drinks are obligated to take back the post-consumer materials of the products they placed in the market. This responsibility has necessitated the establishment of Producer Responsibility organizations (PRO) and the introduction of eco-friendly beverage containers that can be easily reused or recycled repeatedly. The efficiency of the waste management authorities or PRO's in discharging their duties greatly depends on the willingness of households or consumers to separate their waste in accordance with the waste management guidelines and to return the empties of beverage containers to collection centers. The recycling process starts with the consumers of beverage drinks who now play a dual role of end user and a material supplier in the modern day supply chain of beverage containers.

In conclusion, government can enact laws on several issues bothering the society but one aspect of the society that legislation cannot fix is attitude. Government cannot legislate on attitude and that is the reason some cities in developing countries including Lagos are defaced with empties of beverage containers.

It is not sufficient for government to enact and enforce laws on sustainable waste management or to compel producers of beverage containers to take back the post-consumer materials of their product. Consumers' involvement and their attitudes towards waste should also be of prime importance to government and other stakeholders of the supply chain. And through public awareness and continuous education of consumers on what is expected of them and what they stand to gain by practicing sustainable waste management. It is then that consumers will have a rethink of their actions and also help them to develop the right attitudes. Lastly, sustainable waste management policies and the display of the right attitude by stakeholders of the supply chain will not only address the waste collection problem in the city of Lagos. It will also bridge the gap between the point of consumption/disposal and the reintegration of UBC into production lines.

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Legislation

Act on Excise Duty on Certain Beverage Packages

EU Directive (2008/98/EC)

EU Directive (1994/62/EC)

EU Directive (2004/12/EC)

Finnish Government Decision on Packaging and Packaging Waste (962/2012)

Finnish Waste Act (646/2011; amendments up to 528/2014 included)

German Packaging Ordinance

Appendix A: Interviews Extract

Mr. Ola Oresanya, a former Managing Director of Lagos State Waste Management Agency (LAWMA).

"Waste is a descriptive word used to qualify a discarded resource from a particular position within a time frame. Any material that you are discarding from point A to B can be regarded by you as a waste. It must move from point A to point B and that point B is where you can add value to the waste. So if waste was discarded at point A and it is not evacuated to point B, then it becomes a nuisance and will start restricting you. It will constrict your own flow and could be in a form of epidemic."

Mr. Adebola Shabi. General Manager, Lagos State Environmental Protection Agency (LASEPA)

He complained about the attitudes of some residents of Lagos state towards waste management in the state. He also said the indiscriminate disposal of waste in the city and the refusal of some people to use the services of government accredited waste collectors are making their work much more difficult.

Paul O'Callaghan. Chief Executive Officer, West Africa energy

He shed light on the relationship that exists between West Africa energy and Lagos state waste management agency and how it connects to their business model. He further stated that their operation covers Apapa and badagry area of the state all the way to the border with Ogun state. The partnership between LAWMA and the West Africa energy makes it possible for Private Sector Participation (PSP) operators to directly discharge as much as 125 metric tonnes of households waste in their facility daily rather than disposing the collected waste on landfills where they may not be put into use again. The dumped household waste are further sorted into different fractions of recyclable materials such as PET, pure water sachets and metals before they are sold to buyers in the packaging industry.

Lolade Oresanwo. Chief Operating Officer, West Africa energy

She corroborated the position of the CEO of West Africa energy by going a bit further to explain how the waste delivered in their facility by PSP operators is treated. She explained that waste first goes through the conveyor belt after they are discharged by PSP operators, after which the waste is manually sorted into recyclable and non-recyclable materials by the picking line employees. The recyclable materials are sorted into fractions like papers, aluminum cans and plastics papers before they are compressed in the batching plants for users in the recycling industry.

Mr. Ola Oresanya, former Managing Director of Lagos State Waste Management Agency (LAWMA).

The former chairman of LAWMA talked about the importance of national policy on waste management and how the absence of it is causing setbacks to the progress of sustainable waste management and conversion into resource. Moreover, he stressed that there is the political will on the part of many stakeholders across Nigeria to find a lasting solution to the issue of poor waste management but the lack of national direction and strategy on waste management is rendering them helpless.

Further, he emphasized that the national government through the Federal ministry of environment should live up to their responsibility by providing accurate data that will aid the planning and efficient waste management across the states. Government should also see it as a point of duty to provide technical assistance to states and also set targets for waste management and conversion on a state by state basis.

Professor Oladele Osibanjo. President waste management society of Nigeria.

The professor stated that the waste sector in Nigeria is a billion dollar industry that is still left untapped. He identified the absence of government policies such as the one that compels producers to use recycled products and for buyers to patronize recycled products as the reason why many still perceive waste as waste. Further, he called on all government agencies in charge of waste management and environmental well-being to live up to expectations by enacting laws that will encourage foreign investors to invest in Nigeria's

environmental sector. .

Appendix B: Questionnaire

Questionnaire table

	Questions	Literature references
1	I am satisfied with the state of waste management in the city of Lagos.	Waste management in most developing countries is in a state of crisis and the catalyst for this problem is population growth, underfunding and lack of will to enforce waste regulations. (Ezeah and Roberts, 2014)
2	Proper disposal of waste will improve the current state of waste management in Lagos.	An estimate of 30 - 60% of urban solid waste in developing is uncollected and as a result of this neglect, the affected people resort to indiscriminate disposal of waste. (Stutz, 2008; Ogwueleka, 2009)
3	Government's investment in environmental sector will improve municipal solid waste management.	The once dilapidated and ineffective waste management authority in the Lagos was resuscitated with the help of investors from within and outside the country. (Ezeah and Roberts, 2014)
4	The recycling and reusing of disposal materials will improve waste management in the society.	The reuse, recycle or re-consuming of packaging waste might reduce many poor waste management problems. (Livingstone and Spark, 1994)
5	The reduction of packaging waste through eco-friendly design of product package will improve management in the society.	Producers can contribute to environmental sustainability by doing away with excessive product packaging which are not economical and do nature no good. (Livingstone and Spark, 2014)
6	Waste management is everybody's responsibility.	Environmental quality is a function of collective responsibility which does not exclude individuals. (Imam et al., 2008)
7	Waste management is the sole responsibility of governments at all level.	
8	Waste management is the sole responsibility of producers.	
9	My household waste is separated into recyclable and biodegradable before the final disposal.	Consumers are the link between the traditional forward logistics and reverse logistics, and the culture of waste separation by consumers is essential for operating a circular economy of materials. (Gonzalez-Torre and Adenso-Diaz, 2002) The success of recycling depends on the separation of waste from household level (Sridhar and Hammed, 2014)
10	It is appropriate to dump household waste on dumpsite, road side or drainage.	Waste is commonly disposed in an environmental unfriendly manner in most developing countries even with the existence of waste collection systems. (Ogwueleka, 2009)

11 12 13 14	How do you dispose used beverage containers at home? How often do you consume products in disposable containers? How would you rate individual performance on household waste management and disposal? How do you dispose of empty PET bottles or aluminum cans of the drinks you bought and consumed in the traffic?	Kofoworola (2007) opined that residents of Lagos dispose their refuse wherever suits them because there was no defined waste collection points in the state. Ezeah et al., (2013) estimated that about 30-70% of refuse generated in cities of developing countries are collected while the other 70-30% are disposed in road sides, lagoons and open spaces.
15 16	Government's waste management and reduction programs are widely publicized. I am fully aware of government directives on waste management particularly the ones on disposing used beverage containers.	Solid waste management policy in Nigeria is weak and its implementation is not monitored to achieve its intended purpose. (Abila and Kantola,2013) Ezeah and Roberts (2012) suggested that public education and massive awareness programs on waste prevention would help in managing waste.
17	The neighborhood I live is not littered with empty plastic bottles and aluminum cans.	Lagosians usually dispose of their waste in an eco-unfriendly manner because of the inability of the waste management authority to provide waste collection point in the state.(Kofoworola, 2007)
18	Producers, particularly beverage drinks and packaging producers are making efforts to encourage consumers to return used containers.	The involvement of packaging and product producers in the management of the post-consumer phase of their products is limted. (Abila and Kantola, 2013)
19	I am aware of the designated centres and agencies where one can return empty beverage containers.	"The Lagos state waste management authority has invested in the establishment of recycling village and recycling banks at strategic locations within the state".(Ezeah and Roberts, 2014)
20	Government legislations will compel manufacturers to more responsive in the collection, recovery and reuse of empty containers.	Dowlatshahi, (2001) stated that the introduction of different environmental and packaging legislation have made producers to accountable for the negative externalities of their products.
21 22	I am motivated to collect and return my used beverage containers to the producers or recyclers. I would return empty plastic bottles and aluminum cans for a token of 10% of the price of the drink.	Cheng and Chiou-nab (2013), state that consumers are either financially or intrinsically motivated to return used beverage containers to producer organizations or recyclers.
23 24	Producers of beverage drinks have been effectively retrieving glass bottles from consumers. However, they are yet to do something tangible on the collection of used plastic bottles and aluminum cans. The extension of the circular economy system of glass bottles to plastic and aluminum cans will	The top producers of glass bottled drinks in Nigeria have a deposit system for collection of glass bottles which is similar to reverse logistics system and such program is not available for plastic bottles and aluminum cans.(Oko and Anayo, 2013)

	facilitate smooth return to producers.	

Appendix C: Recycling banks in Lagos (LAWMA, 2011)

RECYCLING BANK IN DIFFERENT LOCATIONS WITHIN THE STATE

ERIC-MOORE ROAD,SURULERE

ONIPANU BUS-STOP,ONIPANU

ADEKUNLE ESTATE ,EBUTE-METTA.

TAJUDEENOLARENWAJUESTATE,YABA

MUSON CENTRE,ONIKAN

ALAKA BUS-STOP

GBAGADA ,OWORONSOKI

SOBO-AROBIODU,IKEJA

Appendix D: Personal Observation on the streets of Lagos


SUG 2012/2013
KEEP LASPOTECH
CLEAN